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A CASE OF CEREBELLAR ABSCESS AS A RESULT OF CHRONIC SUPPURATIVE OTITIS MEDIA. OPERATION; DEATH; AUTOPSY.

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David S., Irish, single, aged thirty-one years, came to the Infirmary November 23, 1894, and stated that five years ago, without any apparent cause, the right ear suddenly felt "stopped up," and this was soon followed by a purulent discharge, which has continued ever since, except at irregular intervals of variable duration, when it would cease. There has never been much pain. The ear has now been discharging for one week. The membrana tympani is entirely destroyed, and numerous granulations obstruct the entrance to the attic. There is no pain or tenderness over the mastoid. The hearing-distance for the watch is O/56 on the right side, with considerably diminished aërial and bone-conduction.

December 11*th*. The patient was admitted to the Infirmary to-day. The treatment up to date has consisted in the removal with curettes of the granulations in the ear, and the instillation of astringent drops. About six days ago he commenced to have nausea, vomiting, and vertigo, which have persisted up to the present time, the discharge from the ear being less in quantity. The vertigo is present when he lies down, but is much more marked when standing or moving about, with a tendency to fall laterally, but not forward or backward. Vomiting follows whenever he tries to take solid or liquid food. Loss of bone-conduction is very marked and almost absent.

14*th*. As it was impossible to establish proper drainage by removing the granulations around the attic from the auditory canal, I had the patient etherized, and after making the usual incision behind the auricle down to the bone with chisels and gouges I opened the mastoid cells. The bone covering the cells was very dense and like ivory. The antrum, reached at a depth of 32 mm., was found filled with granulations. These were removed, together with granulations in the attic, and the latter cavity enlarged, so that free drainage was established between the

opening in the mastoid and the external auditory meatus, bichloride solution (1 : 5000) being syringed through. Iodoform-gauze was pushed well into the antrum, a few sutures were taken in the wound below, and a bandage applied.

17*th*. Since the operation the patient has rested well; there has been no vomiting, and the vertigo is much less marked. The ear was dressed for the first time since the operation. On removing the packing of iodoform-gauze there was an escape of a small quantity of foul-smelling pus. Bichloride solution was used, and iodoform-gauze reapplied as before. The patient's condition was so much improved to-day that he was anxious to be allowed to sit up.

22*d*. The patient had a severe attack of vomiting on the evening of December 17th, the first time since the operation. On the following morning there was some epistaxis. He has vomited all nourishment to-day until 6.30 P.M. He complains of severe pain on the top of the head, especially marked on the left side and extending to the occiput. Symptoms of facial paralysis on the right side were first noticed this morning. He has dizziness when sitting up in bed. The communication between the mastoid cells and external meatus is free. Balsam of Peru has been used daily in the wound, which is healing nicely.

24*th*. The patient was seen in consultation with Dr. M. Allen Starr, Dr. E. Gruening, and Dr. H. D. Noyes. Vision: right eye, 20/70; left eye, 20/30. Pupils equal and respond to light; undulatory; no paralysis; partial nystagmus on turning the eyes to either side. It was thought by Dr. Noyes that there was a slight œdema of the right optic nerve. The patient complains of severe headache, especially on the left side; vomiting; intense vertigo on motion; staggering gait, which has been present since the vertigo first troubled him; there appeared to be a tendency to stagger to the left; paralysis of the right side of the face, peripheral in character, as the eye was not closed; knee-jerks normal; no difficulty of swallowing nor of speech. The pulse 50 to 60 per minute. From the above symptoms an abscess in the cerebellum (right side) was suspected, especially as the temperature has not been above 99.6° F.

25*th*. All the symptoms were more marked to-day. Patient had slept none; more irritability, but quite clear in his mind; headache intense; vomiting constant; vertigo continued. Dr. Noyes thought the right disk markedly œdematous. Previous diagnosis of cerebellar abscess confirmed and immediate operation advised by Dr. Starr.

Operation. Present: Drs. Starr, Gruening, F. Whiting, and others. After the patient was etherized I enlarged the previous mastoid wound and exposed first the lateral sinus with chisels. The bone was very hard and dense, and the sinus was found normal. I then carried the incision directly backward four inches from the previous mastoid incision and removed a disk of bone 2 cm. in diameter at a point 5 cm. behind and 6 mm. below the centre of the external auditory meatus. There was slight pulsation of the dura, which seemed to be normal in appearance. Under direction of Dr. Starr I introduced a trocar and canula 2 mm. in diameter, withdrawing the trocar and connecting the canula and syringe. Different portions of the cerebellum were explored, but no pus was found. The mastoid incision previously made was then extended upward, and a disk of bone 2 cm. in diameter removed at a point 5 cm. directly above the centre of the external meatus. The

trocar and canula were introduced in various directions, the syringe attached as before, with like negative results. I then chiselled away and removed sufficient bone with rongeurs about the antrum to allow me to explore the roof of the tympanum, but still pus was not found.

Iodoform gauze was then inserted in the antrum, and in the most dependent portions, while the rest of the wound was closed with sutures. Iodoform and bichloride gauze were then applied with a thick layer of cotton and the whole bandaged.

During the operation, which lasted about two and a half hours, it became necessary to administer hypodermic injections of strychnine, digitalis, and whiskey, as the patient's pulse was at times very rapid and weak. At 9.30 P.M. the pulse was 120, temperature 99°, respirations 20. The patient had fairly well recovered from the effects of the ether

December 26*th*. The patient has some pain in the head, but it is much less severe than before the operation; dizziness less marked; pulse 90; respirations normal; temperature 99° F. Iodide of potassium prescribed in ten-grain doses three times daily.

27*th*. Patient better able to close the right eye. There is less dizziness; no vomiting; he takes his nourishment well; pulse good; temperature normal; wound was dressed, it looks well; slight discharge and faint odor.

30*th*. Commenced to have severe pain in the head again yesterday. He vomits occasionally. He was very restless last night. He has occasional epistaxis. The iodide of potassium was discontinued and phenacetin ordered for the restlessness.

31*st*. Pain in the head very severe during the past night. He vomited profusely at 9.45 P.M., and the vomiting was projectile in character. In the early part of the night the patient tore off his bandage, saying that "he was crazy with pain." He rested well, however, during the latter part of the night. He had periods of delirium and deep somnolence, from which he could be fully aroused.

January 2, 1895. The patient was very irritable and noisy during the night, and complained of pain in the left side of the head and in the left eye; Cheyne-Stokes respiration was well marked from 2.30 to 6 A.M. There were noticed occasional "twitchings" on the left side of the face, left arm, and leg during the night. To-day the patient seems much brighter. There is no active delirium and the wound looks healthy.

4*th*. There has been some retraction of the head to-day. The patient has been given chloral and bromide of potassium for the restlessness. He has been delirious at times, but has taken nourishment and retained it all.

5*th*. Patient exceedingly irritable, answering questions in an angry voice. Pupils respond sluggishly to light, the right one being slightly larger than the left one.

8*th*. The patient's condition during the past three days has varied very much. At times he has seemed brighter and has complained of less pain, but the improvement has been only temporary. He was very restless last night, moaning and tearing at the bandage; facial paralysis decidedly better; retraction of the head has disappeared. The heart is weaker, the beats being more rapid. Tongue dry and coated.

9*th*. Patient growing weaker. Whiskey given at regular intervals as well as digitalis and strychnine sulphate hypodermically.

12*th*. The same irritability continues. Delirious at times; the patient constantly grinds his teeth; frequently he uses profane language. He has a wild and haggard appearance, and he is much emaciated. Urine examined: sp. gr. 1034; deep amber color and highly acid; no albumin or sugar; great excess of urea.

13*th*. There seems to be a loss of sensation or motion, or of both, in the left arm. Pupils equal in size, but contracted to size of pin's head.

14*th*. Extreme irritability; frequent delirious periods; haggard, wild-eyed appearance intensified and grinding of teeth frequent. Dr. Charles Stedman Bull examined the eyes to-day and found "pupils equal, react very slowly; neuro-retinitis with exudation rather than a simple papillitis, the exudation being more marked in the region of the disk, and between the disk and the macula, and more marked in the right eye."

15*th*. Patient deeply comatose and cannot be aroused at all; pulse 146 and weak. Respiration is distinctly of the Cheyne-Stokes variety, and has been since 5.30 A.M. He died at 2 P.M., the heart's action becoming gradually weaker and the beats more frequent, rather than any distinct change in respiration, which remained of the moderate Cheyne-Stokes type noted at 9.30 A.M.

From December 11th, the date of the patient's admission to the Infirmary, up to January 15th, the temperature ranged from 98° to 99.6° F., with the following exceptions: January 6th, 9 A.M. Temperature 97.8° F. 9th, 9 A.M. Temperature 97.6° F. 10th, 9 A.M. Temperature 97.8° F. 12th, 7 P.M. Temperature 100° F. 13th, 9 A.M. Temperature 101.4° F. 15th, 9 A.M. Temperature 101.6° F.

Autopsy. Convexity of the brain normal in appearance. There is a slight general distention of the bloodvessels on the anterior part of the under surface of the cerebral hemispheres, but no exudation. The vessels of the pons and of the medulla are markedly distended; no exudation; no thickening of membranes.

Cerebellum. There is evident enlargement of the right lateral lobe of the cerebellum, most marked in its anterior and external portion, where the inferior surface is markedly discolored; it is yellowish, and is soft to the touch. The softening is limited to the anterior external two-thirds of the right lobe, the posterior median portion adjacent to the medulla being of normal consistency. The vessels on the surface of the cerebellum are distinct; but there is no exudation on the surface and apparently no meningitis. On division of the right cerebellar hemisphere, in the horizontal plane, an abscess containing thick fetid pus is found within the hemisphere, in its anterior part, measuring 4.5 cm. anteroposteriorly and 3 cm. transversely. Considerable pus escaped from the abscess at the autopsy; what remained was removed with difficulty by means of running water and cotton. The cavity of the abscess is surrounded by a wall 3 mm. in thickness, which limits it distinctly from the cerebellar tissue. The abscess-wall measures 4.5 mm. in its thickest portion. Posteriorly and external to the abscess the cerebellar tissue in the white matter is softened and discolored, and shows numerous punctate hemorrhages. This softening is most marked upon the superior surface of the cerebellar hemisphere, where the discoloration is present. There is no hemorrhage on the surface and the point of puncture is not indicated by any meningitis. A small defect in the cerebellar tissue, measuring about 2 mm. in diameter, is manifest at a point 5 cm.

to the right of the medulla and 4 cm. from the median limit of the hemisphere. This is probably the point of entrance of the needle at the time of the operation. The abscess has entirely obliterated the corpus dentatum, and its interior limit has encroached upon the middle cerebellar peduncle. The third and eighth nerves had undoubtedly been compressed by its inner portion.

Superior peduncle and fourth nerve normal. No meningitis. Discoloration and a little softening of the middle peduncle. The abscess approached the inferior surface of the cerebellum, which was markedly discolored and softened opposite the exit of the seventh and eighth nerves; but there was no meningitis and there was normal cerebellar tissue lying between the nerves and the abscess.

The puncture into the right cerebral hemisphere was at the middle of the third temporal convolution.

There was no evidence of meningitis over the surface of the cerebellum or anywhere else, so that the operation had been practically without harm to the patient.

According to Körner, abscesses of the brain, as a result of otitis media suppurativa, are found more frequently on the right side of the brain than on the left. In the above case the abscess was situated on the right side. In a case of abscess of the brain which I reported in the *Transactions of the American Otological Society for 1888* the abscess was found, however, in the left temporo sphenoidal lobe. I have reported also another case of an extra-dural abscess in the *New York Eye and Ear Infirmary Reports for 1895*, and in this case the abscess was also on the left side.

Barr, in the *British Medical Journal*, 1887, collected together the histories of seventy-six abscesses of the brain; of which number fifty-five were located in the temporo-sphenoidal lobe, thirteen in the cerebellum, two in the pons, and one in the crus.

In his *Treatise on Brain Surgery*, Starr says: "There are no local symptoms produced by abscesses in the temporo-sphenoidal lobe that we can recognize unless the abscess grows to such a point as to invade the second or first temporal convolution on the left side, when sensory aphasia develops. There are no local symptoms produced by abscess in one hemisphere of the cerebellum unless the abscess grows to the point of invading the middle lobe or the peduncle upon the base, when staggering begins. Thus, it is evident that in a very large majority of the cases of brain-abscess developing after ear-disease, the diagnosis must be based entirely upon general cerebral symptoms and not upon any local signs." The general symptoms as given by Starr are: "(1) Headache, usually general, occasionally worse on the side of the abscess; (2) mental irritability and mental dulness, with slowness of thought, imperfect attention and memory, and occasionally delirium; (3) prostration, stupor, and appearance of illness wholly out of proportion to the other symptoms; (4) temperature occasionally subnormal, showing little

variation, rarely high and usually about 99°, and a pulse which is slow and sometimes intermittent; (5) tenderness of the head to percussion and an elevation of temperature over the side of the head on which the abscess lies; (6) chilly sensations and even an occasional chill; (7) disorder of the entire digestive system, nausea, vomiting, and constipation; (8) facial paralysis of the peripheral type on the side affected; (9) optic neuritis may appear, but is not a constant or even a frequent symptom. Consciousness is usually preserved, but the patient appears stupid, and as the abscess increases the stupor may deepen into coma; and general convulsions not infrequently occur."

Macewen, in *Diseases of the Brain and Spinal Cord*, says that "in two advanced cases of cerebellar abscess, accompanied by meningeal inflammation, the prominent features were those of extreme depression and prostration." Retraction of the head and neck, extremely slow pulse and respiration, with low temperature, and yawning were other prominent symptoms, besides clenching of the teeth from rigidity of the masseters, optic neuritis, and blindness. Macewen says "that the paralysis in such cases may be unilateral and on the same side as the abscess, provided the medulla be affected at a sufficiently low level. If the pons be most affected on the same side as the lesion, then the paralysis will be manifested on the opposite side. If the pressure is general on both sides of the medulla and pons, bilateral paralysis will result." Vertigo and vomiting were well marked in both of these cases reported by Macewen.

When a cerebellar abscess exists together with lateral sinus thrombosis there may be rigors or chills, with elevation of temperature and tenderness along the course of the jugular vein, if that vessel be affected.

Suppurative leptomeningitis is another complication liable to arise to make the diagnosis more difficult. There is apt to be more or less leptomeningitis in cases of cerebral abscess. Diffuse leptomeningitis gives rise to high temperature (without the remissions which are characteristic of infective sinus thrombosis), a rapid pulse, general irritability, and with the special senses very acute.

A case of cerebellar abscess successfully treated by operation has been reported by Mr. H. T. Winter and Dr. Edward Deanesly in the London *Lancet*, December 8, 1894. The patient, a lad, aged sixteen years, was admitted to the hospital February 6, 1894. He had been occasionally deaf for the past six months, but before the present illness was not known to have any discharge from the ear. Before admission he suffered from severe headache, earache in the left ear, pain in the back of the neck, vomiting, and discharge from the ear. After February 1st he was unable to sit up, and rested curled up on the right side. February 3d he shunned the light and the eyes were turned upward and inward. The respirations were not noticeably slow; tem-

perature 97° F.; pulse 60. The lateral sinus was exposed by trephining one inch behind and one-half inch above the centre of the external meatus. Neither bone nor dura showed any sign of inflammation. The opening was then enlarged so as to explore the temporo-sphenoidal lobe with a fine hydrocele trocar, but nothing was found. The cerebellum was then investigated, a larger trocar being used, and thrust inward and forward for an inch and a quarter and the fluid evacuated. Deanesly in the same paper gives a condensed report of 21 cases, together with 2 which came under his own observation. These cases were reported during the past ten years. Of these 23 cases, 15 were males, 5 females, 3 sex not stated. The ages varied from three to fifty-two years. Purulent otitis media was present in all cases. The abscess lay in the anterior part of the lateral lobe of the cerebellum, on the same side as the disease of the ear (when this was unilateral), in all but 2 cases. In every case the abscess in the cerebellum was a simple one. In a great majority of the cases the abscess had arisen by direct local extension of infective inflammation from the posterior surface of the petrous bone to the contiguous part of the cerebellar hemisphere. Sinus phlebitis occurred with or without thrombosis in 7 cases. The previous duration of the otorrhœa varied from two months to fourteen years. Optic neuritis was definitely stated to have been absent in 3 out of 23 cases. In 8 the point was not recorded. Headache was present in all; vomiting present in 14 cases, absent in 3, not mentioned in the remaining cases. In nearly all the cases the temperature was raised above normal in the early stages, but in all, with one exception, it sank to normal or subnormal before operation or death. Other symptoms present in some and absent in others were: slowing of the respiration, Cheyne-Stokes respiration; repeated yawnings; slowness of cerebration and general apathy; irritability and intolerance of light; delirium; rigidity of the neck and retraction of the head; nystagmus; giddiness; unsteadiness in standing and a staggering gait; a tendency to fall laterally or forward; excluding paralysis or irritation of the facial muscles on the same side as the ear-disease, motor or sensory paralyses were observed in only 7 cases. The cerebellum was explored for pus in 12 out of 23 cases. Of the 12 cases 6 were successful, 4 of which were done by Macewen, and they were all difficult and complicated cases. The remaining 2 were comparatively simple cases.

In the case under consideration the pain was more marked on the left side and was of a shooting character, extending from the occiput to the frontal area. The discharge, which had been present for about five years, suddenly ceased and immediately the patient complained of vertigo, nausea, and had a well-marked staggering gait. Whenever the patient sat up in bed and looked to one side there was always a tendency to fall to the opposite side. The staggering gait was considered a symptom

of great importance, together with the slow pulse, facial paralysis (peripheral), and commencing optic neuritis. It must not be forgotten, however, that vertigo, vomiting, and a staggering gait are symptoms observed in labyrinthine disease. Tests made with Politzer's tuning-forks showed that bone-conduction was almost lost, and the question had to be decided as to whether there was a secondary implication of the labyrinth which extended from the middle ear and caused a basilar meningitis. Pressure in such a case might have been made on both the auditory and facial nerves at the internal auditory meatus, giving rise to facial paralysis and loss of bone-conduction. The cochlea was probably not involved, as there was not any tinnitus. In Ménière's disease, and in labyrinthine disease generally, tinnitus is apt to be a prominent symptom.

Macewen attaches considerable importance to percussion of the skull in certain cases, and says that "when the lateral ventricles are distended with serous fluid, as may be occasioned by cerebellar tumors pressing on the fourth ventricle or by occlusion of the veins of Galen, or otherwise, the percussion-note is markedly altered, the resonance being greatly increased," conveying the idea of hollowness. Macewen has found this "clear percussion-note in over forty children and young adolescents, who have had distended ventricles arising from many different causes. In tumors of the cerebellum it is an aid to diagnosis. When present, along with abscess, it points to involvement of the cerebellar fossa."

In my case there seemed to be no difference in the percussion-note on the two sides.

At the autopsy there was not found any carious opening into the cranial fossa through any part of the petrous bone. The outer wall of the mastoid cells consisted of dense bone like ivory.

As thrombosis of the lateral sinus is frequently found to exist in cases of cerebellar abscess, it was deemed important to explore first the sinus before trephining for an abscess in the cerebellum. If the sinus had been affected, I should subsequently have enlarged the opening made to expose the sinus and have attempted to reach the abscess in that way. As I was unsuccessful in reaching the abscess in the cerebellum, I did not feel that, had I allowed the patient to come out of the ether then, I should have done my whole duty from the standpoint of an otologist without investigating the condition of the tympanic roof and exploring the temporo-sphenoidal lobe. I was supported in this view of the case by Dr. Gruening. An examination of these regions, however, gave a negative result.

The operation was performed throughout under strictly aseptic conditions. After an examination of the brain and abscess-cavity, it appears perfectly evident to Dr. Starr and the writer that it would have been impossible to evacuate the pus with a trocar of large calibre, on

account of the thickness of the pus. Granting that the abscess was only half the present size at the time of the operation, it seems to us that the only relief that could have been afforded would have been by an enormous incision into the cerebellum and by dissecting out the wall of the abscess, which was located far forward in the cerebellum under the tentorium. This would have been almost absolutely impossible.

THE INFLUENCE OF HEREDITY UPON THE PROGRESS OF PHTHISIS.

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The subject of the influence of heredity upon pulmonary phthisis has often been discussed, and Reginald Thompson, Pollock, Williams, and others have by their careful analysis of a large number of cases demonstrated the main facts in the natural history of phthisis, in which family predisposition was exhibited. It would, therefore, appear unlikely that I could add anything material to the facts already ascertained, and certainly the number of my cases (250) is insufficient to prove anything new in this matter, and can only be taken as suggestive. The fact, however, that these cases were all treated in Colorado Springs at an altitude of 6000 feet gives them a somewhat different color and interest to the work already reported, which was mostly from hospital cases which were a comparatively short time under observation, and in climates unfavorable to prolonged life, or were private cases sent for the most part to various health-resorts, and their course and often termination were under the observation of physicians other than the reporter, so that the results are probably not so accurate as they might be; these cases, on the other hand, were all under the personal observation and care of the reporter during most of their illness, and many of them after their convalescence. They were not selected, except that only those were taken whose cases could be followed up and their progress and the results positively verified, and, in order to do so the better, no cases were taken which were seen for the first time less than two years ago. With these limitations 250 cases of phthisis are all to report on at the present time, for, though a much larger number of consumptives have been seen and treated during the same period, yet comparatively few of the cases can be traced so as to speak accurately and positively of results. Though it would undoubtedly have been better if the cases were continuous and covered all that were seen, yet as they are widely scattered over sixteen years of practice, they doubtless fairly represent the whole number, and that they are of average material is shown by

the comparison of their general features with the statistics referred to, and as to the results, with the high altitude reports of others, which latter comparison exhibits a strong family resemblance in all the series of reports.

The title of this paper is the influence of heredity upon the progress of phthisis; whereas, perhaps the word heredity should be exchanged for one embracing more, viz., family phthisis.

Family phthisis may be mainly divided, first, into *parental*, where one or both parents had phthisis or tuberculosis;[1] second, *grandparental*, where atavism is shown by one or more of the grandparents being tainted and the intervening parents free; and third, *collateral*, where uncles and aunts, sisters and brothers, were affected.

There are apparently three ways in which the family may effect the development of phthisis, viz.: First, by direct transmission of the bacili in procreation; second, by inheritance of a physique peculiarly susceptible to phthisis; third, by contagion from living with consumptive relatives or in their dwellings.

1. Inheritance of Bacilli.—That the bacilli themselves can be transmitted has been abundantly proved by several observers. The recent work of Whittredge Williams, of the Johns Hopkins University,[2] shows this in the human being.

Whittredge Williams states that a series of systematic examinations have been made of all pathological specimens pertaining to the diseases of women which have come within their reach during the past few years, the material being derived from the operating- as well as the autopsy-table. He writes that "among other things it has served to demonstrate that tuberculosis of the female generative organs is of far more frequent occurrence than is generally supposed, and that instead of being merely a pathological curiosity it should be regarded as a disease of practical interest and importance." These reports indicate clearly the way in which tuberculosis is transmitted from the tuberculous mother to the fœtus, and how tuberculosis may be limited in the mother to the genital organs without disease elsewhere, and serves to explain how a tuberculous father may beget a tuberculous child without there being other than genital tuberculosis of the mother.

The evidence upon this subject is well set forth in a valuable article by the late Dr. John Keating,[3] entitled "The Plausibility of the Direct Transmission of Tuberculosis from Either Parent." My own clinical experience agrees with these opinions. I have known instances where the consumptive father died before or soon after the birth of his child,

[1] These terms are used as equivalent; the cases of phthisis in which tuberculosis is not present are too rare to affect the questions here discussed.

[2] The Johns Hopkins Hospital Reports, vol. iii., Nos. 1, 2, and 3.

[3] Archives of Pediatrics, Sept. 1893.

and where the element of contagion must be eliminated, knowing the habits of the family, the child subsequently developing tuberculosis and the mother remaining apparently quite healthy. The direct transmission of bacilli from the mother to the fœtus has been proved by Birch-Hirschfeld, and others, and several authentic cases were recited at the last Paris Congress of Tuberculosis.

The experiments of Hericourt and Richet upon dogs, and those of Gertner, have demonstrated the same facts with regard to animals.

Gertner gives the following summary of his article:[1] "The *résumé* of the whole series of experiments in a few words is as follows:

"Among the animals upon which experiments were made were mice, canary birds, and rabbits.

"As a result of the experiments which I have selected, I find that very often tubercle bacilli are transmitted from mother to offspring. To draw a conclusion from these experiments on animals and apply it to man is a matter which must be left to everyone's judgment.

"As these experiments have shown me a frequent transmission of tubercle bacilli from mother to offspring among the species I have chosen, and as statistics show that mortality from tuberculosis in man is greatest during the first year of his life, as also the disease is a chronic one, and the infection takes place at a relatively late fœtal period, and at birth tuberculosis cannot be expected to show itself, I assume, contrary to my former view, that with man, also, the tubercle bacillus is often transmitted from mother to child.

"The experiments with rabbits and guinea-pigs have shown nothing which would indicate the transference from father to offspring.

"Where tubercle bacilli were found in considerable number in the semen, infected offspring did not follow, but rather an infection of the mother occurred.

"If here I also draw a conclusion from the experiments on animals for man, it will be that in man also tuberculosis is not transferred by the copulative act from the father to the child. This is proven by the numerical ratio between spermatozoa and tubercle bacilli, even where the animal is especially susceptible to tuberculosis; there is only one bacillus to from 14 to 140 million, 1:14,000,000 or 1:140,000,000 spermatazoon in the semen. Also by the rarity of primary genital tuberculosis in the female and the mechanical impossibility of an inert, motionless tubercle bacillus attaching itself to a lively wriggling spermatozoon."

That the bacilli can be transmitted not only from the parents, but also occasionally from the grandparents is very probable. The revelations of autopsies which show tuberculosis of glands, etc., in persons who were

[1] Zeitschrift für Hygiene und infect. Koch & Fluege; No. 2, vol. B., p. 93.

believed to have had no evident tuberculosis, and who died from other causes, and the probability of many of the surgical tuberculoses of children being due to latent bacilli, which gave rise to no symptoms until a traumatism furnished the inflammatory products for the bacilli to feed upon, to retire again into innocuous desuetude with the rest given by splints, etc., to the inflamed parts, renders it almost, if not quite certain, that bacillary infection may be transmitted through a silent generation. Dr. Keating's article furnishes also good evidence for this belief.

2. INHERITANCE OF SUSCEPTIBILITY.—In the collateral cases the question of the direct transmission of the disease of course does not enter. We have, therefore, for these cases to look for some other explanation of the undoubted connection and influence of collateral family predisposition upon the development of phthisis.

This relation is perhaps most often to be accounted for through the second channel through which the family may influence phthisis; that is, through the inheritance of a physique peculiarly susceptible to bacillary infection, or to the development of tuberculosis when once engrafted, or to both, and this inherited susceptibility may be that of a general deficiency or lack of power of resistance, or of a more special character, whereby the bacilli readily find entrance and are easily conveyed from one part to another, or the physique is perhaps more often one in which both of these conditions prevail; thus this tendency may be inherited through parents, who are silent, not having been exposed to sufficiently trying conditions to develop the disease, or because the influence of one parent was antagonistic; whereas, in the offspring circumstances favored the reception and growth of the disease, or the influence of the other parent was toward increasing the susceptibility. While it may be considered highly improbable that more than a very few of the cases with collateral taint inherited the bacilli from parents who showed no disease themselves, yet, on the other hand, it is very probable that among those with parental or grandparental predisposition there are many in whom there was no transmission of bacilli, but only of physique. This would seem most likely when the family predisposition was paternal.

3. FAMILY CONTAGION.—We must now consider the question of contagion. This, as far as we know, means reception of the disease by inhalation. That children breathing the air of rooms in which their consumptive parents, brothers, sisters, uncles, or aunts were living or had lived, could inhale the dried sputum in the form of light dust, and so become inoculated with the bacilli, is unquestionably true, and no doubt a certain proportion of the cases of family phthisis can be accounted for in this way.

That a large number of so-called hereditary cases were not exposed to the dangers of family contagion is obvious, such as those whose consumptive relations with whom they lived, died too long before the onset of their

own symptoms to make it probable that they could have communicated the disease personally or through the dwelling. Again, many were never in connection with the previous case, either personally or through other media. At a meeting of the New York Academy of Medicine held January 21, 1892, there was a discussion on the prevention of tuberculosis, which brought out some very interesting statements and facts. From among them I quote a portion of the remarks of Dr. D. C. G. Currier as pertinent to the question: "Although the temptation is ever present to use a 'royal road' for learning about the origin of the disease, and by assuming the inhalation theory as explaining all cases, and considering other explanations as unwarrantable, it must be insisted that the inhalation theory accounts for only a portion of the cases, and that, after all, heredity seems a very potent source, as evidenced by the common-sense experience of clinicians and statistical observers, as well as by bacteriologists of the highest standing, such as Prof. Baumgarten and others, who are thoroughly conversant with the exclusive literature of the subject and acquainted with all the progress and changes of the decade. An infant seems quite as liable to inhale the bacteria of desiccated sputum as an adult is, and then to develop tuberculosis of the lungs, if the inhalation theory is adequate to account for all cases; but we have the clinical fact presented us that the lungs do not develop tuberculosis in infants as often as in adult life, yet the glands, bones, and joints are relatively very often affected without any evidence that the infection arose primarily in the subject through inhalation of bacteria. These considerations, together with the occurrence of cases of fœtal tuberculosis, and the demonstrations by comparative biologists of the presence of bacteria in ova, as well as the established fact that 'structurally healthy testicles of tuberculous subjects can have bacilli detectable in their spermatozoa'—all of these considerations warrant the conclusion that tuberculosis may be inherited. That is, the most potent factor in the causation of tuberculosis can, in fœtal cases, be conveyed from a parent or parents immediately to the unborn child." To explain later developments, whether manifested in the lungs, or in the bones, joints, glands, or elsewhere, the assumption of heredity seems more adequate than the inhalation theory, particularly because in childhood the lung manifestations are decidedly in the minority, even if we do not include the considerable percentage (12) of latent tuberculosis reported by Bollinger and others who have made autopsies of children."

The questions of the probabilities, in each case, of the influence of the family phthisis being direct transmission, susceptibility, or contagion, have not been followed out so that statistics on this point can be given, but I am acquainted sufficiently definitely with the circumstances of enough of the cases to be satisfied that the theory of contagion leaves many unaccounted for.

Whatever the explanation of the development of phthisis among those with family phthisis, there are certain differences between acquired and so-called inherited phthisis which have been demonstrated by comparison of cases in large numbers, as has been done by Reginald Thompson, Williams, and others, which make the recording of further cases of value, not only in assisting the elucidation of the origin of the disease, but its prevention, prognosis, and treatment. I will, therefore, proceed to the analysis of my own cases and their comparison with others.

Analysis of Cases.—The number among the 250 cases of phthisis here reported in whom family phthisis was exhibited in parents, grandparents, uncles, aunts, sisters, or brothers was 139, parental 72, grandparental 19, collateral 48, while the acquired cases were 111. The accompanying table shows how the percentages compare with the statistics of others. It will be seen among five reports covering the same ground that there is a resemblance. On adding the percentages together and dividing by five the number of reports, the average percentage thus obtained is 53.1 per cent. of heredity, which is within 2 per cent. of that of my cases, showing that they are average ones on the whole in this respect at least. Again, it will be seen that taking parental cases alone, the figures are closely alike, about 25 per cent., except those of Dr. Williams,[1] which are 12 per cent., while the percentage of the five reports is 23.4 per cent., showing my cases to be 5 per cent. more than the average, while Dr. Williams' are nearly 12 per cent. less than it. Dr. Williams accounts for his small percentage of parental cases by the fact that his patients were of the richer class of persons and the others mostly hospital cases. My cases also, however, were mostly of well-to-do people and not hospital patients. Whether the different nationality of the patients, English and American, accounts for this contrast, I do not know.

Table I.

Reporter.	Total No. cases of phthisis.	Total per cent. with family predisposition.	Percentage of cases.		
			Parental.	Grandparental.	Collateral.
Solly . . .	250	55.3	28.8	7 6	19.2
Williams . .	1000	48.4	12.0	1.0	34.4
Fuller . . .	385	59.0	25.0	...	...
Denison . .	202	51.0	...	...	...
Fisk . . .	100	52.0	...	...	...
Brompton Hospital	1010	....	24.4	...	...
Cotton . . .	1000	....	25.0	...	...

"Brompton Hospital reports include only parents. Dr. Cotton's 1000 cases, including, however, only parents, brothers, and sisters, gives

[1] Pulmonary Consumption, by C. T. B. Williams, M.D., and Charles Theodore Williams, M.D. Second edition, London.

36.7 per cent. family predisposition, and Dr. Pollock's, with the same relations, 30 per cent. Dr. Copland, without particulars, puts it at 47 per cent. Louis, Briquet, and Rutz give confirmatory estimates." (Williams.)

SEX.—Of the total number of cases 72.8 per cent. were males and 27.2 per cent. females; 52.7 per cent. of the males and 65 per cent. of the females exhibited family predisposition. This is in accord with the other statistics, which always show a higher per cent. of inheritance among females, though Dr. Reginald Thompson,[1] after an elaborate analysis and consideration of a large number of cases, comes to the opinion that this discrepancy is due to the larger proportion of deaths among female infants, and that many of these deaths are from phthisis, though not so reported, and if they were included it would be found that heredity was present in about an equal proportion in the two sexes.

In acquired phthisis Thompson's statistics show that females have less power of resistance, are earlier attacked, and are more often acute.

He further shows that in inherited phthisis males exhibit increased susceptibility in early life and lessened resistance and a larger proportion of acute cases, thus bearing a strong resemblance to acquired female phthisis, while inherited females have the same characteristics as acquired, only exaggerated.

TABLE II.—AGE.

	Solly, 250.	Williams, 1000.
	Percentages.	
Average age of attack of total number of cases . .	29.5	28.2
hereditary	29.2	24.9
acquired	30.2	29.1
hereditary, males . . .	27.0	27.0
hereditary, females . . .	27.6	21.5
acquired, males . . .	29.1	30.3
acquired, females . . .	27.0	23.0

The average age of attack in my cases, as is seen, was a year later than Williams's. The hereditary cases of both sexes combined average a year earlier in attack in my cases than the acquired, while in Williams's they are as much as four years earlier. Taking them by sexes we find that my hereditary males were attacked two years earlier than the acquired, while Williams's were three years earlier. My hereditary females were attacked six months later than the acquired, while Williams's hereditary females were attacked seven and one-half years earlier. Thompson's statistics demonstrate, as do Williams's and mine, that the hereditary cases are earlier attacked, and that the females both hereditary and acquired are earlier attacked than the males, and this is especially true of the hereditary female cases, which latter is not so,

[1] Family Phthisis, by Reginald Thompson, M.D. Published by Smith & Elder, London.

however, in my statistics. Whether this is from the operation of some special cause or because the number of cases is too limited, I do not know. The fact that in other respects our statistics are closely alike makes the latter improbable as the reason. Thompson shows that out of 4000 cases 2000 inherited and 2000 acquired, that up to twenty-five years of age the number of cases of inherited phthisis is more than double what it is after thirty years, being in proportion of 11 to 4.8, while in the acquired the proportion is only 3.7 to 7.4.

Stage of Disease.—With regard to the quality of the cases, of the total number 42.4 per cent. were in the first stage—that is, of tuberculization, 31.6 per cent. in the second stage, softening having commenced, while 24.8 were in the third stage, cavities being obviously present; of the hereditary cases 46.3 per cent. were in the first stage, 24.5 per cent. in the second stage, and 28.7 per cent. in the third; of the acquired cases only 27.8 per cent. were in the first stage, while there were 42.3 per cent. in the second and 19 per cent. in the third.

The larger proportion of first stage cases, among those with family predisposition, is in accord with other statistics, and I found the same to prevail in a continuous one hundred recently examined cases of my own, and also that the duration of the symptoms before treatment was begun was shorter among the hereditary than among the acquired cases. Among hereditary cases the explanation of these two facts lies probably in this, that the knowledge on the patient's part of the danger from inheritance causes him to seek advice earlier, whereas the case with no family predisposition lives mostly in the fool's paradise of the common error that there is no consumption except through inheritance.

Physique.—The limits of the paper do not allow of the showing of another fact, that of the comparative frequency with which persons of strong physique who are attacked with phthsis succumb, and as a strong physique is the greatest bulwark against the inroads of the disease, it is probably accounted for by the neglect of the warning on the part of the strong owing to the popular belief that subjects of consumption are only found among the feeble; whereas, we now know that the bacillus is no respecter of persons. Also, being unaccustomed to take care of themselves they are, when out of health, less prudent than the delicate.

There is possibly another reason why those of a strong physique are frequently attacked, and why the disease when started is so often rapid and fatal in its course; it is that being born, as they usually are, of a stock untainted with phthisis, they have no inheritance to grant them a partial or complete immunity or even tolerance, and the tuberculosis follows a like course to that of syphilis and certain other diseases when they attack a community previously free from such affections.

Results.—The results are grouped under four heads: cured, greatly improved, improved, and worse. The cured are those in whom all signs

of disease have disappeared and whose general health is good. The greatly improved are those in whom the disease is apparently permanently arrested and the health good, and yet there remain some local signs or some disability. The improved are those whose fate is still uncertain, but whose tendency appears toward arrest and improvement, while the worse embrace all those who are deteriorating or have died, as the time of observation has been so prolonged most of these have died.

Totals. Of the hereditary cases 39.5 per cent. were cured and 69.1 per cent. benefited. Of the acquired cases 52.1 per cent. were cured and 72.2 per cent. benefited.

First-stage cases. Of these 65.7 per cent. were cured, that is, in so far as this disease may admit of the term; while taking the cured, the greatly improved, and the improved together, it may be said that 86.1 per cent. were benefited, while 13 per cent. deteriorated. In the first stage cases there were 62.5 per cent. cured and 89 per cent. benefited of the hereditary cases, while of the acquired there were 69 per cent. cured and 83.3 per cent. benefited. So that while of those with inheritance fewer are pronounced cured, yet the total number receiving benefit is greater.

The second and third stage cases taken together show among the hereditary, cured 16.5 per cent. and 49.3 benefited, and among the acquired, 35.2 per cent. cured and 61.2 benefited.

We thus see while the hereditary cases did almost as well as the acquired where they came under the influence of the climate during the first stage, they did infinitely worse in the later stages.

TABLE III.—STAGE.

	Percentages.		
	Cured.	Benefited.	Worse.
Total of all the hereditary cases	39.5	69.1	39.9
Total of all the acquired cases	52.1	72.2	27.8
First stage:			
Total hereditary	62.5	89.0	11.0
Total acquired	69.0	83.3	16.7
Parental	70.6	88.2	11.8
Grandparental	66.6	91.6	8.4
Collateral	44.4	100.0	0.0
Second stage:			
Total hereditary	26.4	64.7	35.3
Total acquired	34.7	54.3	45.7
Parental	33.3	66.6	33.4
Grandparental	0.0	66.6	33.6
Collateral	23.5	57.0	43.0
Third stage:			
Total hereditary	6.6	41.6	58.4
Total acquired	17.4	56.5	43.5
Parental	20.0	50.0	50.0
Grandparental	0.0	25.0	75.0
Collateral	0.0	50.0	50.0

The results among the three classes of heredity when compared with each other show that in all stages the percentage of cures is much higher among the parental than among the grandparental and collateral, and this superiority is more marked in the second-stage cases than in the first, and most marked in the second stage. The grandparental show more cures than the collateral in the first stage and less in the second and third stage. Comparing the parental with the acquired cases, we find a little higher percentage of cures among the parental in the first-stage cases, and a decidedly lower percentage among the parental cases in the second and third stages.

This is doubtless explained by the parental cases in the first stage being those who were especially impressed with their danger, and therefore changed their climate earlier and were more cautious in their conduct, while those parental cases which deferred changing climate till their disease had advanced to the second or third stage, did worse than the acquired, because many of them had inherited a worse physique, and their conduct was at least no wiser than the others.

The paternal and maternal cases show, on taking the total averages of all stages of each and comparing them, that while the percentage of cured is slightly better among the paternal, there were decidedly fewer benefited and more deteriorated, and comparing them both with the acquired the latter was in all respects much better.

In comparing the first-stage parental cases it is seen that the per cent. of cured is again higher among the paternal, as is that of the deteriorated, while the benefited are fewer, thus following the average of the totals.

In the second-stage cases the paternal continue to show a better per cent. of cured, while the average of the benefited is reversed, being higher than the maternal, and the deteriorated lower.

In the third-stage paternal cases none was cured, while 25 per cent. of the maternal are so reported, but more than twice the percentage of paternal cases were benefited.

It appears, therefore, that while on the whole the maternal received more benefit than the paternal, this was due to the larger percentage benefited in the first-stage cases, while in the second and third stage the percentage of benefited was higher among the paternal.

TABLE IV.—PARENTAL.

	Percentages.		
	Total.	Benefited.	Worse.
Total of all the acquired cases . . .	52.1	72.2	27.8
Total of all the paternal cases . . .	40.9	65.9	34.1
Total of all the maternal cases . . .	42.3	59.5	40.5
First stage:			
Acquired	69.0	33.3	26.9
Paternal	73.3	75.0	25.0
Maternal	64.7	94.1	5.9
Second stage:			
Acquired	34.7	54.3	45.7
Paternal	50.0	75.0	25.0
Maternal	27.2	63.3	36.4
Third stage:			
Acquired	17.4	56.5	43.5
Paternal	0.0	80.0	20.0
Maternal	25.0	37.5	62.5

Deterioration. It is interesting to see how these results compare with those of Reginald Thompson, but the only point at which the comparison can be made is in the proportion of those who deteriorated, as Thompson does not give the results as to cured or benefited, but shows the order of severity, which is equivalent to my column of deterioration headed worse. In making this comparison we find that Thompson's results make the order as follows: Maternal worst, paternal next, and acquired best; while mine show the paternal to be the worst, the maternal next, and again the acquired best. Taking the benefited column in the same way, we get the same results; while looking at the cured column alone, we find the order the same as Thompson's, the paternal being a little better than the maternal. Again, comparing the worse column in each stage of my cases with Thompson's totals, we find that in the first stage the acquired are the worst, the paternal next, and the maternal best. In the second stage the acquired are again the worst, while the maternal have changed places with the paternal. In the third stage the maternal are the worst, the acquired next, and the paternal the best.

It is perhaps well to look for a reason for this. In my cases the total maternal show up better than the paternal, contrary to Thompson's, which are from a very much larger number of cases, and, it is fair to assume, exhibit what may be termed the natural history of phthisis, as his statistics are almost entirely drawn from hospital patients who were subjected for most of the time of their illness to the trying conditions of life among the London poor, and who were all the time under the depressing influence of the English climate, both of which would more than offset the benefits of hospital care and treatment, and therefore it is probable that they exhibit the natural tendency of the disease without material hindrance from other causes; whereas the few cases I

report, while showing a strong resemblance to those of Thompson's and other observers, and therefore probably being of the same average material as his to start with, exhibit a difference in the results as regards maternal and paternal cases. Possibly for these reasons, in referring to Table IV., it will be seen that my maternal cases show better than the paternal in the total, because the first stage is better, and it is probable that my number of first-stage cases is greater in proportion than Thompson's, and therefore have more effect on the totals. As the poor, from whom Thompson's cases are drawn, are more apt to delay seeking advice than the well-to-do people, who comprise my cases, therefore my first-stage cases have proportionately more influence than his; but as his cases are not reported as to the stage they were in when first coming under observation, this cannot be proved.

Again, Thompson shows that the disease among the maternal cases is markedly more acute than among the paternal, and that the largest number of the maternal cases die within eighteen months. That is evidently the natural tendency; but my cases, coming early under the beneficial influence of altitude, many of those were cured or benefited who would in London probably have died within eighteen months, whereas the paternal cases, being naturally more chronic, would not be so quickly or markedly influenced in the first stage. While the arresting and curative influence of altitude is exhibited more or less, with some few exceptions, upon all forms and stages of pulmonary tuberculosis, it is especially manifested in its relatively brilliant results upon early acute tuberculosis, which is the form taken by most of the maternal cases, as shown by Thompson and confirmed by the observations of others, including myself.

The influence of sex upon my results is not apparent. While Thompson's extensive and voluminous statistics give some interesting points of difference, they do not apparently affect the general conclusions with which we have been dealing, and the number of my cases when divided up into sexes is too small at present to justify any conclusions or even inferences, and it suffices to say that I have looked into the matter sufficiently to be satisfied that my cases do not show any important sexual differences from those of Thompson.

Conclusions.—The conclusions arrived at from the foregoing study of family phthisis are, that the connection between phthisis in an individual and phthisis in the family of the same individual must be through one or more of three channels, viz., by inheritance of bacilli, by inheritance of susceptibility, or by contagion.

In the past the first channel, *i. e.*, direct inheritance of the tuberculosis, has been credited with being the most frequent and almost only route along which tuberculous phthisis travelled, and for this reason many cases without previous phthisis in the family have been unrecognized

and untreated till in a hopeless condition, and many were ascribed to inheritance when the disease had in reality travelled along the third route, viz., that of contagion; and, further, undoubtedly many cases where the family phthisis had affected the individual only through the channel of an inherited susceptibility were attributed to true heredity. Admitting these points, and also that the cases of direct inheritance are very much fewer than was usually supposed, and the importance of realizing that what most have thought to be the necessary doom of heredity can be averted in many cases and modified in all, by care of the sputum, cleanliness, sunshine, and ventilation in the dwelling, and also by the continuous healthy life and personal hygiene of the threatened descendant, *yet the evidence is too strong to ignore heredity as an important cause of tuberculosis.*

The recognition of heredity is undoubtedly of considerable importance in diagnosis, prognosis, and treatment, especially in the ordering of the life of the patient with respect to climate and occupation. And this recognition should not be lost sight of in the present much-needed crusade against careless expectoration.

The analyses of cases with family phthisis here given confirm in a general way what has been demonstrated by other observers, viz., that whatever may be the explanation of the pathological connection between the consumptive and his phthisical relations, there are certain broad differences in the character and course of hereditary phthisis when compared with the acquired disease. These stated briefly are that the percentage of females is higher among the hereditary than the acquired cases, and the hereditary females exhibit the characteristics of their sex when phthisical much more strongly, being earlier attacked and more of them dying within eighteen months, and also in showing less resistance. The male hereditary cases exhibit relatively the same peculiarities as the male acquired. The hereditary cases as a whole are much earlier attacked than the acquired, and the proportion of cases in the first stage when coming under medical observation is much greater among the hereditary.

In considering the origin and natural history of family phthisis my statistics can be compared with a large number of other reports; but as to results the means of comparison are more meagre, especially in reports from cases treated in high climates. However, those that are available bear out in the main the same conclusions, viz., taking all the cases in all stages together, and comparing the hereditary with the acquired, the results are better among the acquired than among the hereditary, while in the first-stage cases alone there are more benefited of the hereditary than of the acquired.

The parental cases are shown to do better than the grandparental or collateral, and the acquired better than the parental, except in the first

stage. In comparing the totals of the paternal, maternal, and acquired cases, mine stand in the following order of results most benefited: First, acquired; second, maternal; third, paternal. Thompson's order is: First, acquired; second, paternal; third, maternal. While there is a strong resemblance between my cases and those of others, there are, as has been shown, points of difference, some of which are probably due to the especial influence of altitude. The theory that under certain conditions family phthisis grants immunity, or modified immunity or tolerance, receives some support from these inquiries, and from my own clinical impressions, but especially in the view that heredity cases when they do not die, as so many do, in the onset of the disease, are generally more chronic in their course toward death or recovery than acquired cases. And it may be said that the knowledge of inheritance, though depressing to the descendant, is also salutary in inducing prudence of life and a ready resort to medical aid when attacked.

THE ANTI-BACTERIAL ACTION OF ACETANILID.

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and
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Acetanilid, also known chemically as phenyl-acetanamide, C_6H_5NH-C_2H_3O, is produced by the action of aniline upon acetic anhydride or acetyl chloride, and is an odorless, white, crystalline powder of low specific gravity, only very slightly soluble in cold water, but soluble to the extent of nearly 1 per cent. in boiling water.

Although well known as a therapeutic agent, acetanilid has only recently been advocated as a surgical dressing. Dr. Harrell,[1] surgeon of the Seattle Coal and Iron Company, found that the wounds of men injured in the mines were very difficult to heal, even when the best antiseptic agents known were employed; and in his endeavor to find some more efficient dressing, and being impressed by the strong antibacterial powers of some of the coal-tar derivatives, he tried acetanilid. His results were most encouraging, in every instance the wounds healing quickly, even where coal-dust and other foreign matter had gained entrance.

Since the publication of Dr. Harrell's article acetanilid has been substituted for iodoform in the surgical dispensary of the German Hospital of Philadelphia, and in only a few cases has suppuration occurred. In his report[2] Dr. Hand says that this powder is far superior to iodoform,

[1] Medical News, October, 1893.

[2] Medical News, vol. lxiv. p. 269.

the dryness of the wounds in all cases being remarkable. Another to follow Dr. Harrell's example was Dr. Knowles,[1] who, having used acetanilid in many severe surgical cases in veterinary practice during the past winter, is very enthusiastic in its praise.

From a clinical standpoint, then, it would appear that acetanilid is a germicide, or, at least, an antiseptic, and it is the object of this paper to ascertain whether laboratory experiments will support this clinical evidence. Is acetanilid a germicide, or is it simply an antiseptic?

The distinction between an antiseptic and a germicide should be well understood. Sternberg defines these terms as follows:

"Antiseptics restrain the growth of micro-organisms which produce septic decomposition without destroying their vitality. Disinfectants destroy the germs of infectious diseases. Germicides is an extended term of the latter—agents that kill non-pathogenic bacteria as well as disease germs."

But little has been published regarding the effect of acetanilid upon micro-organisms. Lépine, in an article on the "Physiological and Therapeutic Action of Acetanilid," in the *Revue de Médecine* for 1887, only incidentally touches this point. In the few experiments made only watery solutions of the powder were used, but in spite of this and in spite of the fact that he worked with very dilute solutions, the results would seem to indicate a slight antiseptic action.

Preliminary Experiments.—A number of preliminary experiments demonstrated that acetanilid had a decided inhibitory effect on the growth of the staphylococcus pyogenes aureus. In these experiments acetanilid crystals were added to nutrient gelatin in amounts roughly estimated to be about 10, 5, 1, ½, and ⅛ per cent.; the tubes were then placed in the steam sterilizer from fifteen minutes to one-half an hour. Upon removing them the acetanilid was in some instances found to be entirely dissolved; in others it was still visible as an oily mass, varying in size with the amount of acetanilid added. Again, of two tubes containing the same percentage of acetanilid one would show this oily appearance, while in the other at the bottom would be a hard amorphous cake of acetanilid.[2] As the tubes gradually cooled off crystals of acetanilid appeared in all tubes containing more than 1 per cent. of the powder. The gelatin was then hardened as quickly as possible in cold water, that the crystals might be held in suspension, and by constantly shaking the tubes an even distribution of the acetanilid through the gelatin was obtained. The tubes were then inoculated with staphylococcus pyogenes aureus, this being the organism most frequently occurring in pus.[3] The result was in every instance a marked inhibition of the growth of the organism. Even in the tubes containing only one-

[1] Medical News, vol. lxiv. p. 419.

[2] It was afterward learned that this was probably due to the uneven distribution of heat in the steam chamber; for by boiling such acetanilid tubes over an open flame the amorphous cake quickly became an oily mass, and this an instant later went into solution.

[3] According to Fraenkel, it is present in 80 per cent. of all cases examined.

eighth of 1 per cent. of acetanilid the inhibitory action was noticeable, though slight, if compared with a control-tube.

Profiting by our experience in these preliminary experiments we now practically repeated them, using, however, every care to get the percentages correct. In the following experiments the more common organisms of surgical diseases were used: The pus-producing micrococci-staphylococcus pyogenes aureus, staphylococcus pyogenes citreus, and an unidentified non-liquefying coccus, sent to us and accidentally labelled staphylococcus pyogenes albus; also bacillus pyocyaneus, commonly called the bacillus of green pus. In all experiments the organisms used were in a vigorous condition.

Experiment I.—To each of six tubes containing 5 c.cm. of melted nutrient gelatin was added 0.5 gramme, or 10 per cent., of acetanilid. These tubes were then boiled, thus dissolving the acetanilid. Upon cooling most of the acetanilid crystallized out, filling the medium with crystals. The gelatin was then solidified as rapidly as possible in cold water, as before mentioned. As a result the gelatin was rendered perfectly opaque. Two tubes were then inoculated with staphylococcus pyogenes aureus, two with staphylococcus pyogenes citreus, and two with bacillus pyocyaneus; three control-cultures were also made in nutrient gelatin, free from acetanilid, and all the tubes were left to grow at the room-temprerature under exactly similar conditions.

After *four days* the control-cultures were growing rapidly, but there were no signs of growth in any of the other tubes.

On the *eleventh day* there was very slight evidence of growth in the staphylococcus pyogenes aureus and the staphylococcus pyogenes citreus tubes, while the gelatin in their controls was practically completely liquefied. The tubes inoculated with bacillus pyocyaneus were still sterile with the exception of the control, which had grown extensively.

On the *twentieth day* the aureus and citreus tubes containing acetanilid presented the following appearance: On the surface and in the centre of the gelatin where the inoculating needle entered there was, in every case, a little circular pit-like depression, perhaps two mm. in diameter and two mm. in depth. This pit was partially filled with a thick, cloudy fluid, which proved, upon microscopic examination, to be filled with cocci. This was the only evidence of growth in these tubes, the gelatin on the sides and below this depression being still perfectly firm.

The bacillus pyocyaneus tubes were still sterile on the twentieth day, excepting, of course, the control-tube in which the gelatin was almost completely liquefied by the growth of the organism.

On the *fortieth day* the pit above referred to had become much deeper in the citreus tubes, but its diameter was unaltered, and the hollow seemed to contain no fluid. One of the aureus tubes presented a similar appearance, while in the other the whole upper part of the gelatin was liquefied for nearly one-quarter of an inch. The bacillus pyocyaneus still showed no evidence of growth.

Experiment II.—This experiment is similar to Experiment I., except that in this case 0.25 gramme, or 5 per cent., of acetanilid was used. The tubes were prepared as before, but the amount of acetanilid crystallizing

out was not so great as in the first instance, therefore the gelatin, although still well filled with crystals, and consequently opaque, was not so much so as in the first experiment, and the growth could be better observed.

Fifth day. The acetanilid-tubes show no growth, while the control-tubes have developed much and are rapidly liquefying the gelatin.

Eleventh day. Undoubted growth in the aureus and citreus tubes containing acetanilid, with very slight liquefaction of the gelatin at the surface. Their control-tubes are entirely liquefied.

Twenty seventh day. The gelatin in the acetanilid tubes inoculated with staphylococcus pyogenes aureus is about half liquefied by the growth of the organism; the gelatin in the similar citreus tubes is about one-quarter liquefied.

The tubes inoculated with bacillus pyocyaneus are still sterile, except the control, which is more than two-thirds liquefied.

Fortieth day. The growth and liquefication have slightly increased in aureus and citreus tubes. Bacillus pyocyaneus tubes are still sterile.

It is interesting to compare this experiment with a similar one performed by Jeffries[1] in his work upon iodoform. The experiments are in every way similar, excepting that Jeffries used 5 per cent. of iodoform. On the second day all the tubes were growing, and on the fourteenth day they were completely liquefied.

Experiment III.—Identical with Experiment I., except that 0.05 gramme, or 1 per cent., of acetanilid was used. In this case all the acetanilid went into solution on boiling, leaving the gelatin perfectly clear, when it was again solidified. After some days, however, the room becoming somewhat cooler, a few crystals of acetanilid appeared in different parts of the gelatin, mostly upon or near the surface. But this in no way deterred one from easily watching the developing of the organisms along the needle-track.

Sixth day. No evidence of growth except in the control-tubes.

Ninth day. There is a slight growth along the track of the inoculating-needle in the acetanilid tubes, while the control-tubes show rapid growth and much liquefaction. (See photographs of aureus and citreus tubes taken to-day.)

Twenty-second day. There is no visible increase in the growth of the acetanilid-tubes since the ninth day.

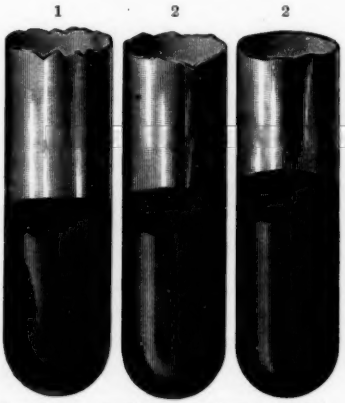
Fortieth day. Hardly any visible increase in the growth. Bacillus pyocyaneus tubes containing acetanilid are still sterile, their control-tube, of course, is completely liquefied.

In this experiment the non-liquefying coccus was also used, and on the fortieth day there was a meagre growth in the acetanilid-tubes along the needle-track, but none on the surface, while the control-tube showed more growth along the track and the thick surface-growth extended almost to the glass.

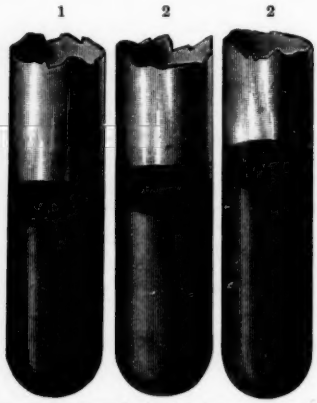
A similar experiment to the above was made with 1 per cent. iodoform in gelatin. In this instance the iodoform did not dissolve upon boiling, therefore the tubes were quickly cooled in ice-water, that the crystals might be evenly distributed through the gelatin. The tubes were then

[1] AMERICAN JOURNAL OF THE MEDICAL SCIENCES, January, 1888.

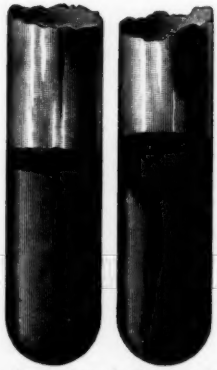
inoculated with staphylococcus pyogenes aureus and staphyloccocus pyogenes citreus. On the third day there were an excellent growth and marked liquefaction of the gelatin.



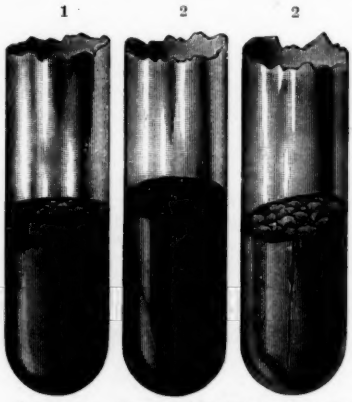
S. p. citreus. Growth after ten days. 1. Control-tube. 2. ½ per cent. acetanilid-gelatin tubes.



S. p. aureus. Growth after ten days. 1. Control-tube. 2. ½ per cent. acetanilid-gelatin tubes.



S. p. citreus. Growth after nine days in the acetanilid-gelatin and control.



S. p. aureus. Growth after nine days in 1 per cent. acetanilid-gelatin and control.

Experiment IV.—Identical with the preceding, except that 0.025 gramme, or ½ per cent., of acetanilid was used. In this instance all the acetanilid went into solution upon boiling, none ever crystallizing out again, and the gelatin remained to the end as clear as if nothing had been added to it.

Fourth day. All the control-tubes are growing rapidly, and one of the citreus and one of the aureus tubes containing acetanilid have begun to develop.

Eighth day. All the aureus and citreus tubes containing acetanilid show a slight growth.

Tenth day. The growth above mentioned has increased but slightly. The control-tubes, however, are much liquefied. (See photographs of aureus and citreus tubes taken to-day.)

Sixteenth day. But little increase in the growth of the aureus and citreus tubes containing acetanilid, and as yet little or no liquefaction. Very slight growth along the track in the bacillus pyocaneus tubes, except control, which is rapidly liquefying.

Thirtieth day. The aureus and citreus tubes have continued to develop slowly, and the gelatin is now about one-quarter liquefied. In the bacillus pyocaneus tubes there is still only a delicate line of growth along the needle-track, the control, of course, being entirely liquefied. In this experiment, also, the non-liquefying coccus was used, and on the thirtieth day the difference between the acetanilid- and control-tubes was marked. In the former, although the surface-growth was decided, it was by no means so extensive as in the latter. The same may be said of the track-growth.

It is interesting to note that in these series of experiments the inhibitory action of acetanilid was much more marked in the 1 per cent. than in the 5 per cent. or 10 per cent. tubes. It also seems evident that the growth of the bacillus pyocyaneus is much more affected by the presence of acetanilid than the other organisms. The more extensive development of staphylococcus pyogenes aureus and staphylococcus pyogenes citreus in the 5 per cent. and 10 per cent. tubes compared with the 1 per cent. tubes is inexplicable.

Several other experiments were made with 1 per cent. and ½ per cent. acetanilid gelatin, the only difference being that the gelatin was solidified on the slant. In some instances the tubes were kept upright, and in others they were kept at the solidifying angle. The inoculation in these cases being a surface one, the growth of the organism (staphylococcus pyogenes aureus alone was used) was more extended, as was anticipated, but liquefaction took place only slowly in the ½ per cent. tubes, while the 1 per cent. tubes did not liquefy at all, the growth remaining only a surface one.[1]

Similar experiments were performed with 1 per cent. and ½ per cent. acetanilid agar-agar. In the 1 per cent. tubes, as in the case of the gelatin, some of the acetanilid gradually crystallized out on cooling, but the ½ per cent. tubes remained perfectly clear. Line-inoculations with staphylococcus pyogenes aureus were made upon the surface from a liquefied gelatin culture, sometimes using a small looped and sometimes a straight needle. There was always a rich development in the

[1] The experiments with the 1 per cent. oblique acetanilid gelatin tubes are not final. The tubes were only under observation for ten days, and up to that time liquefaction had occurred in only one of these tubes, and here but very slightly. At this period the room became overheated, melting the gelatin and spoiling the experiment. Unavoidable circumstances prevented its being repeated.

½ per cent. tubes, although this was much slower than in the control-tube, while in the 1 per cent. tubes there was no growth, or, at most, it was only meagre.

Experiment V.—Three agar-tubes were inoculated by drawing a small loopful of a partially liquefied culture of streptococcus pyogenes aureus once over the surface of each tube. The agar was then covered in two cases lightly, in one quite thickly with acetanilid. A control was also made and all tubes were left in an upright position at the room temperature.

Third day. Excellent growth on the surface of control-tube; others show no growth.

Fiftieth day. Acetanilid-tubes still show no growth.

This experiment was repeated several times, occasionally placing only a very thin layer of acetanilid on the surface of the agar. Staphylococcus pyogenes aureus was the organism generally used, but in one case the tubes were inoculated with the unidentified coccus. Sometimes the inoculation was made in a line only, and again it was made over the whole surface of the agar. The tubes were kept under various conditions, both in an upright position and at the angle of solidification; sometimes at the temperature of the room, sometimes at 37° C. The results were invariably the same: the tubes having only a thin layer of acetanilid upon the surface of the agar occasionally grew slightly for a few days, after which development ceased. In one instance, where the whole surface of the agar was inoculated and afterward covered here and there with a light layer of acetanilid, growth took place up to the crystals, but here it always ceased.

The results are quite different if oblique gelatin is used instead of agar, as the following experiment will show:

Experiment VI.—Several tubes of oblique gelatin were inoculated with streptococcus pyogenes aureus from a partially liquefied culture. The inoculations were made with a small looped needle, great care being taken to inoculate only the surface in a line and to avoid cutting the medium. The gelatin in these tubes was then covered with different thicknesses of acetanilid and the tubes with a control were left in an upright position.

Second day. Control-tubes growing rapidly and already liquefying, so that a little fluid is collecting at the bottom of the gelatin. Acetanilid-tubes show no signs of growth.

Fifth day. The acetanilid-tubes show evidence of growth, the gelatin being slightly and unevenly depressed along the inoculating-line. The gelatin in the control-tube is so much liquefied that it no longer retains its oblique position.

Tenth day. Acetanilid-tubes are so much liquefied that the gelatin no longer holds its oblique position.

This experiment was repeated several times; occasionally so much acetanilid was used that the space between the surface of the oblique gelatin and the glass was almost filled with it; again, only the thinnest

possible layer of acetanilid was spread over the surface. Sometimes the tubes remained upright and sometimes at the angle of solidification, but the results were practically invariably the same: growth was generally first observed in the tubes containing the least acetanilid, but by the sixth day growth was visible, as a rule, in all the tubes, the control-tubes of the same date, however, being well advanced.

In these experiments the growth is entirely referable to the medium employed. Gelatin being rather soft, the organisms are able to penetrate and, by their peculiar chemical action, to liquefy it, thus to a certain extent freeing themselves from direct contact with the acetanilid. Although the growth is inhibited to a great extent, liquefaction having once begun, the development is very rapid.

In the case of agar the circumstances are quite different. It is impossible for the organisms to penetrate or liquefy this firm medium, and, although a slight growth may take place, the organisms must always be more or less in close contact with the acetanilid. It might be that in this instance the bacteria are mechanically separated from the medium. This could easily have taken place when shaking the tube to distribute the acetanilid over the surface, but it is exceedingly unlikely, since, in similar experiments with gelatin, such a separation could also have occurred, but it never did, as shown by the subsequent growth.

Experiment VII.—Five per cent. of acetanilid was added to three tubes, each containing 10 c.cm. of bouillon. The bouillon was then boiled and the acetanilid dissolved, much of which afterward crystallized out upon cooling and sank to the bottom of the tubes. These and also three control-tubes, containing each 10 c.cm. of bouillon, were then inoculated with a medium sized loopful of staphylococcus pyogenes aureus from a liquefied gelatin-culture. After forty hours gelatin plate-cultures were made, each containing a small loopful of bouillon. The plates made from the control-tubes produced countless colonies, whereas the colonies on the plates made from the three acetanilid-tubes numbered 640, 160, and 133. Plates were again made in the same manner on the sixth day, and the controls again gave countless colonies, while the acetanilid-tubes gave between 5000 and 10,000.

It is interesting to compare this experiment with a similar one performed by Dr. Jeffries with iodoform:

"To three tubes, each containing ten cubic centimetres of bouillon, was added 5 per cent. of iodoform, and then one drop of water with staphylococcus pyogenes aureus. Three more tubes exactly the same, except for the iodoform, were prepared, and all six stood in the same rack. At the end of twenty-three hours agar-agar plate-cultures, each containing one drop of bouillon, were made. The plates made from the tubes with iodoform came very thick, too thick to count, yet distinct; those made from the simple bouillon were just like ground glass.

"The above was repeated three times, but the drop of bouillon was

diluted in 10 c.cm. of water, a drop of which was taken for the plates. These could be counted, and gave from two to four times as many colonies in the plates made from the simple bouillon as in those from iodoform. For instance, one lot gave me 20,000, 20,000, 21,000, as compared with 5000, 6000, and 7000."

Comparing these two experiments, it is again evident that acetanilid has a much greater antiseptic action than iodoform. It was, for instance, a simple matter to count the colonies on the plates made with a small drop of bouillon after forty hours' growth, while Jeffries was obliged to dilute his drop of bouillon in 10 c.cm. of water before colonies could be counted. Indeed, in none of his experiments, did Jeffries obtain any marked inhibitory action to the growth of the bacteria caused by iodoform, and he was forced to conclude, as many other investigators have also done, that iodoform, from a laboratory standpoint, is only to a very slight degree an antiseptic.

In this experiment another interesting point was developed, namely: while the control-tubes were quickly clouded by the growth of the organisms, the acetanilid-tubes remained to the end almost perfectly clear; and while the scum forming upon the surface of the control-tubes was decidedly yellow, a similar scum, but forming much later, on the acetanilid-tubes was almost white. This loss of color when staphylococcus pyogenes aureus is grown in the presence of acetanilid was also observed by Lépine.

The following experiment is interesting as showing how acetanilid, when present even in very minute quantities, inhibits the development of staphylococcus pyogenes aureus.

Experiment VIII.—A saturated solution of acetanilid was made by allowing the crystals to remain in cold distilled water for several days. To several bouillon-tubes was then added an equal volume of this solution, to others one-half the volume. To a control tube was added an equal volume of water. All the tubes were then inoculated with staphylococcus pyogenes aureus.

Twenty-four hours. Control-tube is cloudy, the others clear.

Third day. All the tubes are cloudy.

The foregoing experiments demonstrate that acetanilid has a decided inhibitory action upon the growth of bacteria, and that it is, therefore, an antiseptic.

The following experiments were then undertaken to ascertain if acetanilid was also a germicide:

Experiment IX.—To 5 c.cm. of the saturated solution of acetanilid (saturated in the cold, as in Experiment VIII.) was added a large loopful of a liquefied gelatin-culture of staphylococcus pyogenes aureus. The tube was then well shaken, to insure a thorough separation of the organisms and an even distribution of them through the fluid, and immediately a large loopful of the mixture was spread over the surface of an agar-

tube. For five successive days a similar loopful was carried over to agar, shaking the acetanilid-tube well each day. Agar-tubes were used instead of the gelatin plates, as the developing colonies can be counted nearly as well, and by placing the agar-tubes in the thermostat results are much more quickly obtained. The colonies upon the agar gave the following count:

Agar-tube made immediately after mixing			=	countless colonies.
"	"	after 24 hours	=	200 colonies.
"	"	" 2 days	=	60 "
"	"	" 3 "	=	27 "
"	"	" 4 "	=	5 "
"	"	" 5 "	=	1 colony.

Experiment X.—Similar to Experiment IX., except that 5 c.cm. of a saturated solution of acetanilid (saturated by boiling, and therefore much stronger) were used:

Agar-tube made immediately after mixing			=	countless colonies.
"	"	after 17 hours	=	countless colonies, but less than above.
"	"	after 2 days	=	130 colonies.
"	"	" 3 "	=	62 "
"	"	" 4 "	=	38 "

A similar experiment to the above, using 5 c.cm. of a supersaturated solution of acetanilid (saturated by boiling) gave a like result.

These experiments would seem to indicate that acetanilid has no marked germicidal action, the gradual decrease in the number of organisms being due to starvation.[1] In order to prove this supposition, similar experiments were made, using 5 c.cm. of boiled distilled water without acetanilid, and the average results of several experiments are as follows:

Staphylococcus pyogenes aureus in distilled water.

Agar-tube made immediately after mixing			=	countless colonies.
"	"	after 24 hours	=	400 colonies.
"	"	" 2 days	=	210 "
"	"	" 3 "	=	100 "
"	"	" 4 "	=	60 "

It should be borne in mind that the figures quoted in the above experiments cannot be directly compared. Although the same platinum-loop was used in all these experiments, it is impossible to imagine that the drop carried over in this loop was always of the same size. Slight variations in the size of this drop would make a difference of many thousand organisms, and therefore the number of colonies developing upon the agar from day to day might differ very widely even in several experiments performed in exactly the same manner. Nevertheless these experiments sufficiently demonstrate that the gradual diminution in the

[1] If, for instance, the same experiment is performed, substituting 5 c.cm. of a 0.25 per cent. solution of KOH for the acetanilid solution, no colonies are obtained after three hours. In this case the death of the organisms is not due to starvation, but to the germicidal action of KOH, weak as it is.

number of organisms was not due to the presence of acetanilid, but to starvation, since similar results were obtained when distilled water alone was used.

Experiment XI.—From all the gelatin tubes containing acetanilid which were used in the foregoing experiments, and in which the little growth which did take place soon ceased, fresh gelatin-cultures were made after fifty days.

The fresh cultures were made from the 10 per cent., 5 per cent., and 1 per cent. acetanilid tubes inoculated with bacillus pyocyaneus remained perfectly sterile; but the cultures made from the ½ per cent. acetanilid-tube inoculated with bacillus pyocyaneus gave a typical growth.

In the case of the aureus and citreus tubes containing acetanilid, and the tubes inoculated with the unidentified coccus, the new cultures grew rapidly and typically in every instance.

This experiment indicates that acetanilid may have a very slight germicidal action, but it must be very limited, since bacillus pyocyaneus was alone destroyed, and this presumably only after several weeks.

Experiment XII.—From the agar-tubes in which no growth was visible after thirty to thirty-eight days, and which had been inoculated with staphylococcus pyogenes aureus (both line- and surface-inoculations), and then covered with different thicknesses of acetanilid, fresh cultures were made. The acetanilid was first partly lifted from the surface of the agar, a needle was then rubbed about where the organisms were supposed to be, and this needle then transferred to fresh medium. In nearly every instance a typical growth of staphylococcus pyogenes aureus resulted.

Another series of experiments was begun which consisted of mixing a drop of bouillon, made turbid with staphylococcus pyogenes aureus, with various amounts of dry acetanilid, and from time to time making cultures from this mixture. These experiments were unavoidably cut short, but the results as far as obtained only added more evidence to prove that acetanilid is not, or is at least only very slightly, germicidal.

Conclusions.—Although acetanilid has not been very widely employed as a surgical dressing, in the cases where it has been used, the results have been so successful that its superiority over iodoform seems very probable, and its use instead of the latter indicated. There is no danger of poisoning from absorption of acetanilid, and the utter absence of odor is an additional plea for its substitution for iodoform as a dressing.

Laboratory experiments uphold the clinical proof of its value as a surgical dressing, but since laboratory experiments are really no evidence of what goes on in the body the only conclusions to be drawn from the foregoing experiments are:

1. That acetanilid is probably to a very slight extent a germicide.
2. That acetanilid is decidedly an antiseptic.
3. That, as an antiseptic, acetanilid is far superior to iodoform, and that certainly from a laboratory, and probably also from a clinical, standpoint its substitution for the latter seems warranted.

THE MODERN ASPECT OF INDICANURIA.

WITH SPECIAL REFERENCE TO THE RELATION BETWEEN INDICAN AND THE ACIDITY OF THE GASTRIC JUICE.

By Charles E. Simon, B.A., M.D.,
of Baltimore.

(Continued from page 63.)

To pass on now to a consideration of cases in point, it will be well to take up first in order those in which the presence of free hydrochloric acid could not be demonstrated in the gastric juice.

We here meet first with cases of carcinoma of the stomach:

Hennige (*Deutsch. Arch. für klin. Med.*, 1879, vol. xxiii. p. 271) observed two cases, in both of which the indican was greatly increased in amount, one of these being at the same time complicated with carcinoma of the liver.

Senator (*Centralblatt für die med. Wissensch.*, 1877, pp. 357, 370, and 388; see also *Berlin. klin. Wochensch.*, 1877, vol. xiv. pp. 583–584), speaking of thirteen cases of carcinoma, states that in all of these, even shortly before death, when very little or no food was taken, large quantities of indican were found.

Haeberlein (*Deutsch. Arch. für klin. Med.*, 1889, vol. xlv. p. 339) finds as the result of his examinations of fifty-one cases of carcinoma no increased indicanuria in eleven cases, a moderate increase in twenty-nine, and a very intense indicanuria in eleven cases.

De Vries (*Ueber das Indican im Harn und seine diagnostische Bedeutung*, Dissert., Kiel, 1877) cites one case of colloid cancer of the stomach, in which a violet color resulted, indicating beyond a doubt an increased elimination of indican.

Ortweiler (*Mittheil. aus der med. Klinik zu Wuerzburg*, 1886, vol. ii. pp. 155–188), in an examination of seven cases of carcinoma ventriculi, states that the indican-reaction always was very intense, more so than in any disease of the stomach.

Brieger (*Zeitsch. für physiol. Chemie*, vol. ii. p. 256), in an examination of two cases of carcinoma, observed an abundant elimination of indican.

Wasbutzki (*l. c.*) describes five cases of carcinoma of the stomach in which the indican-reaction was noted as present, and mentioned as being increased in one case, the hydrochloric acid being absent in all cases.

To these cases I wish to add the following observations of my own:

Case I.—M. B., aged fifty-four years, carcinoma of the stomach of nine months' standing; profound cachexia and general prostration; tumor palpable; repeated attacks of coffee-ground vomiting; death in coma; no free HCl; indican-reaction most intense.

CASE II.—L., aged fifty-eight years, carcinoma; death after two years; tumor palpable; profound cachexia and prostration; death in coma; no HCl; indican-reaction most intense.

CASE III.—G., aged sixty-four years, carcinoma; tumor palpable; profound anæmia, closely simulating pernicious anæmia; no free HCl; indican-reaction intense.

CASE IV.—H., carcinoma of the stomach and cæcum. An artificial anus was established at the lower end of the ileum, the cæcum having been excised for carcinoma. The patient died a few days later from shock, the sutures having broken loose in consequence of a severe attack of coughing, the intestines being expelled through the wound to an extent of two or more feet. It was expected that no indican, or merely a trace, would be present, the entire colon being eliminated. Instead of this, however, an enormous quantity was obtained, and the diagnosis of cancer of the stomach made. This was fully confirmed at the autopsy.

The gastric-juice examination before the operation showed the absence of free HCl acid.

In addition to these four cases of cancer, in all of which an intense indicanuria existed, associated with the absence of free HCl, it will be well to report in this connection several cases of functional anachlorhydrie. The histories are given in detail, having not as yet been reported, and the small amount of material in the literature, according to Ewald, calling for the publication of further observations.

CASE V.—M. G., aged twenty-three years, hysterical vomiting, associated with anachlorhydrie and the presence of large amounts of indican in the urine.

For the past twelve years the patient, in whose general history or antecedents there is nothing special of note, has been subject to vomiting, which occurred almost daily. She had been working in a factory for many years, doing piecework, and, although she repeatedly gave up this occupation and underwent medical treatment, no improvement, or at least no improvement exceeding three to four weeks, resulted. The vomiting was not preceded by nausea, and it occurred independently of the taking of food; no special kind of food, moreover, could be said to disagree, tomatoes and candies, for example, being frequently well borne, while white of egg, milk, beef, soup, etc., would be followed by vomiting soon after. The vomiting finally was, to a certain extent, under the control of the will, so that her friend, after I had informed the latter of what I considered as the true nature of the case, was frequently able to prevent her from vomiting by walking her up and down the room, wrangling with her, teasing her, etc. Every morning also the girl was in the habit of "having a good cry," as she said, frequently lasting for a quarter of an hour, or even longer, for which she could assign no special reason. The general impression of the girl was that of a hysterical person, but not of what is ordinarily termed a nervous person.

Other symptoms, beyond a slight tendency toward constipation, were not complained of; she had lost a good deal of flesh lately, but did not worry particularly over her condition. She had a wish to get well, so as to be able to work again, but actually did not appear to care very

much, although her friends informed me that she was very "blue" at times at having been ill so long.

When I first saw the patient, a blonde, in the fall of 1892, she was fairly well nourished, slightly anæmic, presenting no special abnormalities on inspection. Heart and lungs were normal, as also the entire abdomen, there being no points of tenderness on palpation, no evidence of dilatation or atony, etc.

The gastric juice, examined one hour after Ewald's test-breakfast, taken at my office (which she was able to retain), showed a normal process of digestion; free HCl, however, was absent; there was a faint Uffelmann's reaction; the total acidity was 56.

The urine was light-yellow in color, fairly abundant, of 1012 sp. gr., acid, containing a large amount of indican; no special increase in the amount of uric acid, no sugar, and no albumin. A microscopical examination was negative.

The patient was electrolyzed daily over the gastric region with a strong faradic current for thirty minutes; tr. nucis vomicæ in fifteen to twenty-five-drop doses three times daily was ordered. I fed the patient for the first two weeks on small amounts of iced milk, frequently repeated, and raw scraped beef in increasing amounts. On this diet the patient did fairly well, when I allowed her a more liberal diet, and at the expiration of three months she had gained twenty-eight pounds in flesh and was free from vomiting. Since that time she has been under my constant observation (not as a patient), and considers herself as perfectly well.

Her gastric juice, when discharged, contained a very small amount of free HCl; the indican in the urine is still present in a somewhat increased amount, but far less than formerly.

Case VI.—M. H., aged twenty-seven years. The only points of interest in this girl's former history are the existence of a chlorosis, which occurred four years ago, and for which she was, not very successfully, treated with Blaud's pills, the improvement being a very slow one, and not so well marked as is usually seen, probably owing to the unhygienic surroundings under which the patient was obliged to live—*i. e.*, doing work in a workingmen's dining-saloon.

The girl, a blonde, is moderately well nourished, but decidedly anæmic. She complains of frequent pains in the abdomen, an entire want of appetite, occasional vomiting, no nausea, rumbling in the bowels, etc., for several years.

A physical examination of chest and abdomen revealed no abnormalities. A vaginal examination, made several years ago under ether, when the same symptoms existed, was likewise negative.

The gastric juice obtained one hour after Ewald's test-breakfast, and six hours after Riegel's meal, showed the following: There were no remnants of Riegel's meal; the bread was fairly well digested; the amount of juice obtained about 50 c.cm.; acid in reaction; the total acidity, 58; free HCl absent; strong Uffelmann's reaction; no fatty acids. Potassium-iodide could not be demonstrated in the urine four hours after the taking of a Günzburg potassium-iodide and fibrin package.

The urine was of a normal yellow color, clear, moderately acid, of a specific gravity of 1025; it contained no albumin, no sugar, no increase in the amouut of uric acid, and a mere trace of indican.

The treatment ordered in this case was essentially the same as in Case V. Two weeks later the first trace of free HCl could be demonstrated in the gastric juice, with a feeble Uffelmann's reaction and a fair increase in the amount of indican.

The reason which I shall here assign for this apparent incongruity—*i. e.*, anachlorhydrie associated with a normal amount of indican—is the same which Wasbutzki has offered as an explanation of the two cases of anachlorhydrie noted by him, which were associated with no increased, but rather with a diminished elimination of conjugate sulphates—namely, that the antifermentative action of the free HCl had been taken up, as it were, vicariously, by another acid, and in both of his cases, as well as my own, by the lactic acid. The diminution in the quantity of the latter, associated with the appearance of free HCl, in mere traces, however, and an increased indicanuria, which was observed in my own case, as shown above, appears to me further to strengthen this view.

In two cases occurring in the practice of Dr. Henry Salzer, of this city, I was, with him, able to observe a similar condition, where anachlorhydrie, in the presence of much lactic acid, was associated with a complete disappearance of indican from the urine.

Case VII.—This case, which I owe to a verbal communication of Dr. Salzer, occurred in a young woman, whose gastric contents had been examined shortly before the onset of an acute attack of anachlorhydrie, and had revealed a normal amount of HCl, while an examination of the urine at the same time showed no increase in the amount of indican. During the twenty-four hours following a high degree of ungratified sexual excitement, a complete loss of HCl, and, going hand-in-hand with the same, an enormous increase in the amount of indican was noted. It was possible in this case to exclude definitely other causes that could have brought about such a condition.

In this connection it may be mentioned that Ultzmann (*l. c.*) not infrequently observed an increased indicanuria in various neuroses. He thus states that in masturbators occasionally large quantities of indican are found in the urine, the pollutions even of such individuals producing stains in the linen, which appear blue or violet at the edges, when dry, and that after excesses in venery, as well as after sexual excitement in general, not infrequently large amounts of indican are found, and that such a condition is by no means rare in nervous and hysterical women.

To pass on now to a consideration of the cases of acute gastritis and gastro-intestinal catarrh, meaning thereby that form which is essentially produced by dietetic errors, be they referable to overeating, to overdrinking, or to the ingestion of food improperly prepared, or individual articles of food, which, owing to an idiosyncrasy on the part of the individual, are invariably followed by gastric distress, but which may also be

produced by cold, such as the eating of large amounts of ice-cream, the drinking of much ice-water, etc., and, finally, the direct exposure of the entire body, or parts thereof, particularly the abdomen, to cold draughts and the like.

Free HCl in such cases is probably always absent, or present in greatly diminished amount at least.

Ortweiler (*l. c.*) found the indican always increased in four cases (the entire number studied by him in this direction), one of which was referable to the ingestion of beer in excessive amounts. He states that in the acute gastro-intestinal catarrh, which he was always able to produce in his own person by the drinking of large quantities of beer, the indican was invariably eliminated in increased amount.

Hennige (*l. c.*), having examined a large number of these cases, states that increased indicanuria was observed almost without exception, and that the degree of indicanuria essentially ran a parallel course to the intensity of the pathological process.

DeVries (*l. c.*) speaks of four cases of acute gastro-intestinal catarrh, in all of which much indican was observed in the urine.

The number of such cases recorded in the literature in which the indican elimination was studied is thus as yet very small; to these I may add my own observations:

CASE VIII.—B. Following the ingestion of large quantities of beer, on a hot summer's day, the typical picture of an acute gastro-intestinal catarrh resulted. In the gastric juice no free HCl could be demonstrated; Uffelmann's reaction was feeble; no fatty acids; very much indican in the urine. This condition continued for several days, the clinical symptoms disappearing, together with the excessive elimination of indican.

CASE IX.—The patient, a married lady, aged fifty-five years, whenever attending to preparations for company at dinner invariably excited herself to such a degree that the meal of which she subsequently partook was always followed by a most intense gastritis, notwithstanding the fact that she ate but very little, and of what may be considered as a normal quality of food. In the stomachic contents not a trace of free HCl could be demonstrated, while large quantities of indican were observed in the urine, the condition persisting for two or three days.

CASE X.—Annie D. *Epilepsy.* This case will be reported in detail elsewhere. Suffice it to say at this place that an epileptic attack in her case almost invariably followed a decided error in diet, preceded by the typical picture of a subacute gastritis; the urine at such times always contained large amounts of indican.

CASE XI.—In my own case the exposure of the abdomen to the cool or cold draughts of the early morning during the summer-time, when sleeping uncovered, is invariably followed by an intense gastro-intestinal catarrh, at times even associated with vomiting. The vomited material, which I have frequently examined, contained no free HCl, while the urine was actually loaded with indican.

In this connection also should be mentioned the high degree of indicanuria, so frequently, indeed, I may say constantly, observed in the gastro-intestinal type of influenza.

It has been shown by Manassein (Virchow's *Archiv*, vol. lxx.) that in animals during fever the secretion furnished by the stomach is deficient in HCl, an observation which was confirmed by Hoppe-Seyler, who was able to demonstrate that in fever the amount of HCl also diminishes in man. It should not be imagined, however, that it is the elevation of temperature which produces this condition and the increased elimination of indican, it having been proved by Jaffe and others that such is not the case; and it will be most correct, probably, to refer this anomalous condition to the resorption of infectious material, ptomaïnes, toxalbumins, or substances belonging to the aromatic and fatty acid series, their partial elimination through the stomach, which has been shown to hold good for the poison of cholera, the poison of various snakes, hydrophobia, etc., and the irritation thus produced upon its mucous membrane and probably the nerve-centres. It is true that increased indicanuria is not observed in all cases of acute febrile disease, a point which, however, likewise holds good for the secretory powers of the stomach, the question whether subacidity, anacidity, and increased elimination of indican shall occur, being probably largely controlled by the question as to how far the secretory power is affected by the infectious material circulating in the blood. From my own observations, there can be no doubt that in the gastro-intestinal type of influenza, as well as in typhoid fever, the secretory power of the stomach is greatly enfeebled, while in intermittent fever, pneumonia, and advanced phthisis, unless marked gastro-intestinal lesions exist, a normal secretion is usually furnished by the stomach, associated with a normal or only slightly increased elimination of indican.

Case XII.—B. *Influenza.* On the first day of the disease the vomited material contained no free HCl; the indican in the urine was enormously increased. On the third day of the disease vomiting occurred again, with no free HCl, and a large amount of indican.

Case XIII.—L. S. *Influenza.* In the vomited material on the third day no free HCl; very much indican in the urine.

Case XIV.—H. S. *Influenza.* No vomiting, but complete anorexia, slight diarrhœa, profound prostration; large amount of indican.

Case XV.—M. H. *Influenza.* The same as Case XIV.

Case XVI.—E. G. *Influenza.* Vomiting on second day; no free HCl; much indican.

Case XVII.—G. V. *Influenza.* High fever, cough, anorexia, vomiting on second day; material not examined; much indican.

Case XVIII.—O. H., Jr. *Influenza.* High fever; profound prostration; nausea; moderate diarrhœa; much indican.

Case XIX.—E. P. *Influenza.* Vomiting on first day; no free HCl; very large amount of indican.

Among the eighty cases of typhoid fever which I have examined, increased indicanuria was observed in every instance, whether diarrhœa existed or not, at some stage of the disease. With this observation the results obtained by others, such as A. Robin, in his large series of cases; De Vries, in the six cases which he examined; Ortweiler, in his twenty cases; Gubler, in his extensive experience at the hospitals of Paris; Hennige, who found an increased indicanuria in the fastidium and reconvalescence of typhoid fever; Senator, and others stand in perfect accord.

To these cases I have still to add one of acute toxic gastritis, which I have reported in the *Medical Record*, 1894, being a case of acute gastro-enteritis, due to poisoning by mustard:

Case XX.—S. G. The patient, having taken a cupful of mustard, to produce an abortion, stirred up with vinegar, was seized with intense vomiting and sanguinous diarrhœa. The vomited material was free from HCl (repeated observations), while the urine was actually loaded with indican. As the general condition improved and the patient recovered, the indicanuria gradually became less marked, and ultimately returned to the normal.

Ortweiler's one case, in which no increase could be noted, must certainly be excluded, being a case of acute muriatic-acid poisoning.

In tabulating the cases of anachlorhydrie, set forth above, we find the following:

Observer.	No. of cases.	Diagnosis.	Indican increased.	Indican absent or not increased.
Hennige	2	Carcinoma	2	0
Senator	13	"	13	0
Haeberlein	57	"	40	11 not incr.
De Vries	1	"	1	0
Ortweiler	7	"	7	0
Brieger	2	"	2	0
Wasbutzki	5	"	1	4 not incr.
Simon	4	"	4	0
Total	91		70	15
Simon	3	Hysteria	2	1
Ortweiler	4	Acute gastritis	4	0
De Vries	4	Acute gastro-enteritis	4	0
Simon	12	" " "	12	0
Total	20		20	0
Grand total	114	Anachlorhyd.	92	16

In studying this table we find that an increased elimination of indican has been noted in seventy out of ninety-one cases of carcinoma, in other words, in 76.93 per cent.; in two cases of three, *i. e.*, in 66.66 per cent. of hysterical anachlorhydrie; and in all of the twenty cases of acute gastro-intestinal catarrh. Indicanuria of increased degree would thus occur in 80.7 per cent.

In the fifteen cases of carcinoma in which the indican was merely noted as being present, or as not being increased in amount, it is, of course, impossible to assign a definite cause for this fact; but one cause at least that might be surmised, is the one detailed above under Case VI., and one indeed which Wasbutzki himself has proposed as an explanation of the diminished elimination of conjugate sulphates observed by him. At the same time, however, it would be well if more care be taken by observers, finding deviations from what by others has been established as the norm, in the description of individual cases, and the methods employed. Both have been neglected, particularly by Haeberlein. The fact remains, nevertheless, that in cases of carcinoma—*i. e.*, in cases where free HCl is notoriously absent—an increased elimination of indican is noted in a very large percentage of cases, and may be regarded as the rule.

Further observations will have to demonstrate the state of affairs in cases of functional anachlorhydrie, as my own cases are, of course, not sufficiently numerous to warrant any very definite conclusion, although it would appear that, in the absence of an excessive formation of lactic acid, the same rule holds good, namely that an absence of HCl goes hand-in-hand with an increased elimination of indican.

That this is the rule in cases of acute gastro-intestinal catarrh is apparent from the table above.

To pass on now to a consideration of chronic gastritis, collecting under this heading all those cases in which free HCl is, so to speak, habitually diminished or absent, excluding, of course, all neuroses, as well as carcinoma and ulcus:

Ortweiler describes five cases of chronic gastritis, in all of which indican was found in increased amount.

Senator does not detail any cases under this particular heading, but states that patients who eat but little or not at all, and perhaps vomit the little that they have eaten, or digest the same badly, frequently pass enormous quantities of indican in the urine.

I myself have observed increased indicanuria in the following cases:

Case XXI.—H. J. Right-sided movable kidney; general gastro-enteroptosis; constipation of high degree; irregular appetite, bloated feeling after eating, much belching, palpitations of the heart, hot and cold flushes, vertigo, etc. The indican in this case was present in large amounts.

Case XXII.—Z. J., aged seventy years. The patient complains of diarrhœa alternating with constipation for years; the appetite is capricious; there is nausea, rarely vomiting; vertigo; epigastric distress; a disagreeable taste in the mouth, etc. The indican is very much increased.

Case XXIII.—H. S. The patient, a lady aged sixty two years, has been confined to her bed for many years, being a nervous invalid. She

has been very much over-fed, without having taken any exercise whatsoever; constantly complaining of symptoms largely referable to the gastro-intestinal tract. The indican is always very much increased.

CASE XXIV.—Mrs. K. Similar history to Case XXIII. Nervous invalid; highly hysterical for many years; marked gastro-intestinal symptoms; indican very much increased.

CASE XXV.—Chronic gastritis with atony and a mild degree of dilatation. Only traces of free HCl in the gastric juice; much indican.

An increased elimination of indican in various digestive diseases has thus been frequently observed; and Ortweiler, whose clinical studies in indicanuria are most excellent, thus summarizes his work: "We see, then, that an increased elimination of indican quite regularly occurs in all diseases of the stomach which are associated with alterations in the secretion of gastric juice, with a diminished peristalisis and abnormal fermentative processes, while an increased indicanuria could not be demonstrated in acute toxic gastritis." That these conclusions are essentially correct we have seen; but the observation of Ortweiler, that increased indicanuria is not observed in cases of acute toxic gastritis, certainly does not hold good. (See Case XX.)

That a diminished peristalsis, moreover, is productive of an increased elimination of indican can also only be said to hold water when restricted to cases of mechanical obstruction somewhere in the course of the small intestine, a fact which was first pointed out by Jaffe (Virchow's *Archiv*, *l. c.*), who was able to demonstrate the high value of indican in cases of ileus, a statement, moreover, which since that time has been repeatedly confirmed.

In one case of this kind which I had occasion to observe myself:

Date.	Total H_2SO_4.	Combined H_2SO_4.	Mineral H_2SO_4	A : B.
March 10, 1893,	0.169 per cent.	0.0635 per cent.	0.1055 per cent.	1.66

CASE XXVI.—In which the obstruction was high up in the small intestine, and in which no stool had occurred for three weeks, the amount of indican was enormous; indigo-red also being present in large quantities.

A similar result is seen in cases of acute diffuse peritonitis, some cases of acute circumscribed peritonitis, incarceration of herniæ of some standing, etc.

Obstruction of the large intestine, as well as diseases of the large intestine in general, on the other hand, have been definitely shown to be unassociated with any marked increase in the indicanuria, and if the latter should be observed under such conditions we may, at the same time, infer the existence of disease higher up.

For the sake of illustration, I here quote two experiments of Jaffe's, in one of which the small intestine and in the other the large intestine were ligated:

1. Ligation of small intestine.

Urine before operation:	Dec. 29–31,	2800 c.cm. to	8	mgrms.	of	indigo.
	Jan. 1–2,	2300 c.cm. to	11.5	"	"	"
Urine after operation:	1st day,	1010 c.cm. to	12.5	"	"	"
	2d day, 400 c.cm. / 3d day, 370 c.cm.		76	"	"	"
	4th day, 550 c.cm. / 5th day, 525 c.cm.		88	"	"	"
	6th & 7th day,	1300 c.cm. to	22.1	"	"	"

2. Ligation of the large intestine. (Colon descendens.)

Before operation but very little indican, while after the ligature had been applied the daily amount varied between eight and nine mgrms. only.

In cases of simple constipation, viz., coprostasis, no increased indicanuria is observed, and Ortweiler himself, although he makes a statement to the contrary, does not cite a single case in support of this view, having at the same time detailed all his other cases.

Jaffe says that he has examined the urine of patients suffering with simple constipation innumerable times, and amongst these a case of two weeks' standing (no stool for two weeks), without ever having been able to demonstrate an increased elimination of indican.

De Vries cites several cases of coprostasis, but rarely has met with such associated with increased indicanuria. To illustrate the value of a quantitative estimation (even approximately) he cites one case in which no stool had occurred for eight days, and in which suspicious material was vomited, so that the question as to the advisability of an operation for suspected intussusception was raised, cathartics also having been of no avail when a spontaneous movement occurred. There had been very little indican in this case, and the diagnosis of coprostasis was made on this basis, a small amount of indican being a thing unheard of in ileus.

I, myself, have examined a large number of cases of simple constipation, one of ten days' duration, and have also but rarely met with increased indicanuria; and if this was noted, the increase was associated with symptoms pointing toward an abnormal condition of gastric digestion.

So much, at any rate, may be said, that, as a rule, and as a good broad rule, *an increased elimination of indican is not associated with constipation.*

In surgical cases, where the differential diagnosis may be called for between coprostasis and ileus, a small amount of indican may be regarded as speaking against ileus, and may be truly said to be a more valuable symptom in this connection by far than the absence of free HCl in carcinoma of the stomach. In medical cases there is, of course, never any objection to clear out the colon and repeat the indican-test a day or two later on if any doubt should exist. With an uncomplicated

constipation, moreover, of two or three days' standing an increased indicanuria is never associated, while it may be so with one lasting for a longer period of time, when, however, it also never becomes intense.

Ortweiler says: ". . . . We may thus assume that all diseases of the stomach have a common basis—*i. e.*, the dyspepsia, and it having been established that dyspepsia frequently is referable to an altered condition of the gastric juice, and that in carcinoma it is especially the free HCl that is affected, we might expect that the indican should decrease after the administration of HCl or pepsin." He then goes on to state that he was able to produce a diminution in the amount of indican by means of HCl, and also by pepsin, in a case of carcinoma, the diminution in the latter case, however, being but slight. As far as the influence of pepsin is concerned upon the elimination of indican, this observation, as far as I know, has never been confirmed. More important, however, is the fact that he was able to produce a diminished elimination of indican in two cases of carcinoma and two cases of ulcer of the stomach by means of muriatic acid.

Ortweiler refers this action of the muriatic acid to its digestive, and not to its antifermentative, properties. It is not unlikely that such may be the case in some instances and to a certain extent, the amount of proteid material available for putrefactive processes being thereby, perhaps, diminished to some extent. That such processes will, however, only be prevented when there is an excess of free HCl present—*i. e.*, when all other affinities have become saturated—is a well-known fact, and we hence must still regard the degree of intestinal putrefaction as primarily depending upon the amount of free acid present, and can only secondarily look upon the digestive activity of the free HCl as a factor affecting intestinal putrefaction and the elimination of indican.

To summarize briefly, we have so far seen that:

1. The gastric juice of the normal individual possesses very marked antifermentative properties.

2. That these properties are referable to the presence of free HCl.

3. That the conjugate sulphates are invariably increased in cases of hypochlorhydrie and anachlorhydrie, and diminished in cases of hyperchlorhydrie, provided that in the absence of free HCl its antifermentative properties are not taken up by another acid, such as lactic acid.

4. That the indol production, or rather elimination, is constantly increased in cases of hypochlorhydrie and anachlorhydrie, it being remembered, however, that the action of the free acid here, also, may be taken up in the absence of HCl by lactic acid.

In other words, I believe the conclusion to be permissible that *the degree of acidity of the gastric juice may be directly judged by the elimination of indican in the urine.* That increased indicanuria is quite constantly associated with subacidity or anacidity we have seen. To

demonstrate that a normal amount of free HCl goes hand-in-hand with a normal elimination it is only necessary to examine the urine of a perfectly healthy individual, or one whose digestive functions present no abnormalities whatsoever. For the sake of illustration I shall give a few examples:

Case XXVII.—B., letter-carrier; normal case throughout; no complaints whatsoever; indican normal.

Case XXVIII.—H., neurasthenia cerebralis; free HCl present in normal amount; indican normal.

Case XXIX.—A. H., examined for life insurance and accepted; strong, healthy business man; indican normal.

Case XXX.—E. H., case of eczema and slight neurasthenia; no digestive symptoms whatsoever; indican normal.

Case XXXI.—Mrs. O., lumbago; no digestive symptoms; general health very good; indican normal.

Case XXXII.—Mrs. Ch. J., neurasthenia; free HCl present in normal amount; indican normal.

Case XXXIII.—F. St., male, hysteria; no digestive symptoms; free HCl in normal amount; indican not increased.

Case XXXIV.—Mrs. B., hysteria; various digestive symptoms; gastric juice entirely normal; indican normal.

Case XXXV.—J., male, hysteria; no digestive symptoms; gastric juice normal; indican normal.

In hyperacidity of the gastric juice the conditions do not lie quite so simple, and ulcer of the stomach must be regarded as an exception to the rule, the indican here being almost always present in increased amount.

Ortweiler thus records eight cases, in all of which the indican-reaction was intense and only exceeded by that observed in cancer of the stomach. He also records two cases of hæmatemesis, due to ulcer, in which the reaction was very intense; in fact, more so than in the absence of hæmatemesis.

Hennige mentions four cases of gastro-intestinal hemorrhage, the age of the patients varying between eighteen and thirty-one, which must probably be regarded as cases of ulcer, in all of which the indican was much increased.

Senator states that he met with increased indicanuria repeatedly in cases of ulcer, the reaction being, however, not so intense as in carcinoma, but especially intense when hemorrhages had recently taken place.

Why such should be the case I am unable to say at present, but since the indican-reaction is always mentioned as being more intense at times, when hemorrhages are taking place, or have recently occurred, this fact could possibly become the starting-point of an investigation. Unfortunately for this work, I have not been able to observe a single case of ulcer, these cases being certainly very much more common abroad than

in our country, and I am therefore unwilling to enter upon any explanatory hypothesis.

In several cases of hypersecretio acida et continua, however, which I had occasion to observe, indican could not be demonstrated in the urine with the ordinary tests, and the same may be said of a large number of cases of nervous hyperacidity which I had been able to study under the supervision of A. Robin at LaPitié at Paris, and which has been very constantly observed by him.

Should any doubt, however, arise in a given case as to the presence of free HCl I can only say, from my personal experience, that this may always be cleared up, if the examination for indican is combined with the exhibition of a Günzburg potassium iodide and fibrin package.[1] A delayed potassium-iodide reaction associated with a negative or subnormal indican-reaction I have found, to judge from my own cases, to be indicative of anachlorhydrie, the antifermentative action of the gastric juice being taken up by lactic acid. The presence of much indican associated with a premature or normal potassium-iodide reaction I should upon a hypothetical basis, it is true, regard as a valuable symptom pointing toward the existence of an ulcer.

That ordinary constipation will not give rise to an increased elimination of indican I have already pointed out, and the same may be said to hold good for diarrhœa referable to a catarrhal condition of the colon.

There remains then merely to be considered the effect of the various articles of diet upon the elimination of indican.

Jaffe, working on dogs, found the degree of indicanuria to run a course essentially parallel to the amount of nitrogen ingested.

Salkowsky arrived at similar results, finding much indican in the urine of dogs after fibrin and meat, but none after gluten, in accord with Nencki's observation that gluten does not yield indol.

Peurosch (*Beitrage zur Lehre ueber die Entstehung des Indicans im Thierkoerper.* Dissert., Koenigsberg, 1877. Cited in *Cbl. fuer die med. Wissensch.*, 1878, p. 454), working under the guidance of Jaffe, found that in rabbits oats, potatoes, starch, and sugar have but little influence upon indican-production; fresh grass, but especially meat, produces a greatly increased indicanuria, and the addition of fat in such cases appears to favor its production.

The effect of diet upon the elimination of indican in man has received but very little attention. Personally I have found an increased indican-production after red meats, particularly beef and mutton, while chicken and fish do not appear materially to influence the same. The indican will almost disappear from the urine under a strict Kefir diet; milk and buttermilk have a similar effect.

[1] For sale by Messrs. Hynson & Westcot, of Baltimore.

The green vegetables produce no increase, and the increase which is at times noted after the ingestion of large quantities of peas, beans, lettuce, potatoes, and bread is never very marked.

To summarize our results then:

1. The gastric juice possesses antiseptic and germicidal properties.

2. These properties are referable to the presence of free hydrochloric acid.

3. A subnormal amount of free hydrochloric acid will call forth an increased degree of intestinal putrefaction.

4. The conjugate sulphates form an index of the degree of intestinal putrefaction.

5. The increased intestinal putrefaction in cases of subacidity and anacidity of the gastric juice is largely referable to an increased formation of indol.

6. The elimination of indican in the urine may be regarded as an index of the amount of free hydrochloric acid present.

7. A normal acidity of the gastric juice is never associated with increased indicanuria.

8. Cases of ulcer of the stomach apparently form an exception to this rule, an increased indicanuria being usually associated with hyperchlorhydrie.

9. In other cases of hyperchlorhydrie a subnormal or normal amount of indican is eliminated.

10. Simple constipation is rarely accompained by an increased elimination of indican.

11. Diarrhœa referable to a catarrhal condition of the colon, often following a previously existing coprostasis, as well as diseases of the colon in general, is not associated with an increased indicanuria.

12. In the differential diagnosis between ileus and coprostasis, a small amount of indican excludes the former condition.

13. In cases of anachlorhydrie with much lactic acid the indican is not necessarily increased.

14. No indican, or but little indican with a delayed Günzburg potassium-iodide reaction, indicates the absence of free HCl, with much lactic acid.

15. Much indican with a normal or anticipating Günzburg reaction is suggestive of ulcer.

16. In cases in which the use of the gastric tube is impractical or contraindicated, or in cases of a mere superficial examination, the indican-reaction will furnish a valuable index of the condition of our patient's digestive powers.

17. By means of the indican-reaction we are enabled to follow closely the results of treatment instituted in cases of gastro-intestinal disease.

Given as premises:

1. That a resorption of decomposing pus is not taking place anywhere in the body, as such a process in itself is capable of producing an increased elimination of indican.

2. That there does not exist a stenosis of the small intestine.

3. A normal mixed diet containing no excessive amounts of red meat.

Unfortunately the methods which so far have been proposed for the purpose of quantitatively determining the amount of indican in the urine are not only inaccurate, excepting, perhaps, the spectroscopic method devised by Müller (*Mitth. aus der med. klinik. zu Wuerzburg*, 1886, vol. ii. p. 344), but what is more, too lengthy and complicated ever to be of value to the practising physician. (See Neubauer and Vogel's *Urinary Analysis.*) It is not to be wondered at, then, that the observations made by almost all observers, referred to in the above pages, are based upon an approximative estimation only; for practical purposes fortunately such a method, particularly the one to be presently described, is perfectly sufficient, the degree of increase, which interests us, of course, more particularly, being judged fairly accurately thereby, as is quite generally admitted by the men who have employed this method, and have compared the same with the results obtained by means of the more complicated ones referred to above.

The plan which I personally pursue is the following:

The urine of twenty-four hours is carefully collected, and a specimen therefrom taken for examination. A few c.cm. of urine are mixed with an equal amount of concentrated hydrochloric acid, two or three drops of a saturated solution of sodium hypochlorite or calcium hypochlorite, or, for that matter, of common saltpeter, and one or two c.cm. of chloroform added, the mixture being thoroughly agitated and set aside. The indigo which has been set free in this manner is taken up by the chloroform, coloring this blue to a greater or less extent, the degree of increase as compared with the norm being determined by the intensity of the color. If albumin be present, this should first be removed. Bile-pigment, which interferes with the reaction, is removed by means of a solution of subacetate of lead which should be carefully added, so as to avoid an excess; urines presenting a very dark color may be cleared up in the same manner. Potassium iodide, which, if present, will, owing to the liberation of free iodine, color the chloroform more or less of a carmine color, must also be removed.

For the sake of comparison it is well to employ the same quantities of urine and reagents in every case, marked tubes being very convenient for this purpose.

In this connection I may say that I have found this method at the same time to be a fairly sensitive test for albumin, the mixture of muriatic acid and urine upon the addition of the oxidizing agent presenting

a well-marked cloudiness on the surface of the liquid, gradually extending downward.

I shall here append a table of the cases in which I have tested the urine for indican, in addition to those described above, which were essentially and provenly gastro-intestinal in origin; to these I shall add a table of those which I have found laid down in the literature:

TABLE 1.

Diagnosis.	No. of cases.	Indican increased.	Indican diminished.	Indican normal.	Observer.
Typhoid fever	80	80	0	0	Simon.
Cancer of cæcum and stomach	2	2	0	0	"
Pseudoleukæmia	1	0	0	1	"
Epilepsy	25	13	0	12	"
Syphilis cerebri	2	0	0	2	"
Chronic interstitial nephritis	5	5	0	0	"
Chlorosis	2	0	0	2	"
Albuminuria Da Costæ	7	0	7	0	"
Pneumonia	2	0	1	1	"
Cretinism	1	0	0	1	"
Cystitis	1	0	0	1	"
Dysentery	2	0	0	2	"
Melancholia	1	0	1	0	fasting for 3 wks.
Migraine	3	0	0	3	Simon.
Chronic rheumatism	2	1	0	1	"
Appendicitis	2	2	0	0	"
Ileus	1	1	0	0	"
Nervous diarrhœa	1	0	0	1	"
Chorea	1	0	0	1	"
Pleurisy	1	0	0	1	"
Cholelithiasis	1	1	0	0	"
Following laparotomies	7	7	0	0	"

TABLE 2.

Diagnosis.	No. of cases.	Indican increased.	Indican diminished.	Indican normal.
Acute miliary tuberculosis	2	0	0	2
Typhoid fever	26	26	0	0
Diphtheria	9	0	0	9
Acute articular rheumatism	8	0	0	8
Intermittens	8	1	0	7
Meningitis	1	0	0	1
Scarlatina	6	0	0	6
Morbilli	5	0	0	5
Erysipelas	5	0	0	5
Pneumonia	8	0	0	8
Cholera Asiatica	...	Increase in every case.		
Cholera nostras	4	4	0	0
Constipation	8	2	1	5
Intestinal tuberculosis	10	10	0	0
Catarrh of small intestine	12	12	0	0
Catarrh of large intestine	4	0	1	3
Carcinoma recti	1	0	0	1

Diagnosis.	No. of cases.	Indican increased.	Indican diminished.	Indican normal.
Carcinoma hepatis	5	5	0	0
Carcinoma pancreatis	1	1	0	0
Sarcoma intestinæ paræ	1	1	0	0
Appendicitis	4	4	0	0
Ileus	...	Large increase noted in all cases.		
Peritonitis tuberculosa	12	12	0	0
Peritonitis acuta	10	10	0	0
Cirrhosis hepatis	11	5	0	6
Icterus catarrhalis	12	12	0	0
Icterus et carcin. vent. et hep.	3	3	0	0
Amyloid kidney	...	No increase.		
Granular atrophy	11	4	0	7
Nephrit. acuta et chron.	...	No increase.		
Phthisis pulmonalis	15	0	0	15
Pleuritis serosa	6	0	0	6
Pleuritis purulenta	3	3	0	0
Pyopneumothorax	1	1	0	0
Bronchitis putrida	4	3	0	1
Bronchitis acuta et chr.	8	0	0	8
Bronchiectasis	3	0	0	3
Emphysema	3	0	0	3
Pericarditis	5	0	0	5
Hydropericardium	2	0	0	2
Myocarditis	1	0	0	1
Endocarditis	7	0	0	7
Valvular disease	25	0	0	25
Fatty degeneration	1	0	0	1
Atheroma	3	0	0	3
Aortic aneurism	2	0	0	2
Pernicious anæmia	1	0	0	1
Chlorosis	15	0	0	15
Leukæmia	1	0	0	1
Pseudoleukæmia	1	0	0	1
Addison's disease	5	1	0	4
Morbus maculosus	3	0	0	3
Scurvy	1	0	0	1
Scrofulosis	5	0	0	5
Rhachitis	6	0	0	6
Malignant lymphomata	1	0	0	1
Cerebral tumor	3	0	0	3
Hemiplegia	9	0	0	9
Bulbar paralysis	1	0	0	1
Spinal sclerosis	2	0	0	2
Multiple sclerosis	2	0	0	2
Amyotroph. lateral sclerosis	1	1	0	0
Mening. apoplexy	1	0	0	1
Tabes	3	0	0	3
Sciatica	2	0	0	2
Chorea minor	3	0	0	3
Chorea major	2	0	0	2
Tetanus	2	0	0	2
Epilepsy	3	0	0	3
Hysteria	5	0	0	5

Diagnosis.	No. of cases.	Indican increased.	Indican diminished.	Indican normal.
Facial paralysis	2	0	0	2
Lead colic	2	2	0	0
Chron. arsen. poison	1	0	0	1
Ovarian tumors	3	0	0	3
Carcinoma uteri	3	3	0	0
Chronic ulcerations	5	5	0	0
Trichinosis	3	3	0	0
Hæmoglobin. paroxys.	1	1	0	0
Glanders with intestinal ulcers	1	1	0	0

OBSERVATIONS ON THE DIAGNOSIS OF DIPHTHERIA.

A STUDY OF ITS LOCAL TREATMENT AND A FEW CASES TREATED WITH ANTITOXIN.

By Francis H. Williams, M.D.,
of Boston, Mass.

(Concluded from page 47.)

We now come to the clinical side of the local treatment of diphtheria, and the treatment to which I wish to direct your attention is that with strong hydrogen dioxide acid solutions.[1] The mortality in this State from diphtheria is greatest during October, November, December, and January, and my last service at the Boston City Hospital included the three latter months, November and December, 1893, and January, 1894, but I have permission to consider here the cases that were admitted in October, 1893, also.

On the mild, as well as on the hopeless cases, a 10-volume solution of hydrogen dioxide was generally used, alone or in connection with a solution of corrosive sublimate (1–5000 or 1–2500) or a solution of chlorinated soda. On *all* of the severer cases which came in the early days of the disease, and during my service, I endeavored to use a 50-volume hydrogen dioxide acid solution at short intervals.

To illustrate the advantages of using the 50-volume solution, let me take four patients who entered the hospital about the same time:

Two cases of diphtheria treated with a 10-volume solution of hydrogen dioxide.

P. H., aged twenty-one years, entered the hospital December 1st. Klebs-Loeffler bacilli found in the cultures. Thick false membrane on both tonsils and on the sides of the pharynx. Under treatment of 10-volume hydrogen dioxide solution every four hours the membrane had

[1] I have found these strong solutions useful in minor surgery; they should not be used in closed cavities, as too much oxygen might be set free and cause pressure.

As a dressing for sores and ulcers, one may use a 10-volume solution of hydrogen dioxide containing 0.1—0.2 per cent. of hydrochloric acid; when desirable pepsin may be added to this solution. The dioxide does not interfere with the action of the pepsin.

disappeared on December 20th, but there were still bacilli of diphtheria present on December 20th and 23d. The membrane returned again on January 1st. On January 3d no bacilli were found.

H. N., aged six years, entered the hospital on December 2d. Klebs-Loeffler bacilli found in the cultures. Small specks of false membrane on right tonsil and right palate. Ten-volume solution every three hours. Bacilli still present on December 25th; absent January 5th.

Two cases of diphtheria: the first one treated in part and the other wholly with a 50-volume solution of hydrogen dioxide.

S. M., aged ten years, entered the hospital on December 3d. Bacilli of diphtheria found in the cultures. This case seemed more severe than either of those above mentioned. False membrane on both tonsils, left palate, right anterior pillar, right and left wall of pharynx. At first a 10-volume solution was used, but as the membrane increased a 50-volume solution was substituted. Bacilli of diphtheria present December 10th; absent December 16th.

J. W., aged six years, entered the hospital December 8th. Bacilli of diphtheria found in cultures. A more severe case than any of the above. Thick false membranes on both tonsils and on both anterior pillars. The next day it covered the right, left, and posterior pharyngeal wall. The use of 50-volume hydrogen dioxide acid solution was then begun. Bacilli of diphtheria were present on December 11th, throat clear on December 16th, bacilli absent December 17th.

Of these four cases, the last two to enter the hospital presented more severe local symptoms than the first two, the last one, especially. The patients who entered the hospital December 1st and 2d, respectively, had a 10-volume hydrogen dioxide solution applied, and the bacilli were absent January 3d and 5th, respectively. Average duration of bacilli, thirty-four days. The patients who entered the hospital December 3d and 8th, respectively, had a 50-volume hydrogen dioxide acid solution, and the bacilli were absent December 16th and 17th, respectively. Average duration of bacilli, eleven days.

The three following cases further illustrate this point. The patients were adults of about the same age:

CASE I.—Membrane on tonsils and posterior pharynx. Cultures were made from the throat about every four days and bacilli of diphtheria found. On the fifty-third[1] day of the disease bacilli of diphtheria still found in the cultures; on the fifty-sixth day none was found. The treatment in this case was 10-volume hydrogen dioxide solution every hour, corrosive sublimate 1 : 2500 on a swab every two hours. Finally some of the strong hydrogen dioxide solution was used; after this had been applied for about three days the bacilli disappeared.

[1] The duration of the bacilli in this case is above the average duration of the bacilli in the twenty-three cases alluded to later, in which the treatment was a 10-volume solution of hydrogen dioxide alone, or in connection with corrosive sublimate or chlorinated soda—but in two other of these cases the bacilli were present in the cultures three weeks longer than in this case.

One case of diphtheria in which a *partial* use of the strong dioxide acid solutions was made:

CASE II. entered the hospital more than two weeks later than Case I. Membrane on both tonsils. Klebs-Loeffler bacilli found in the cultures. As there was no strong dioxide solution at hand a 10-volume dioxide solution was used every two hours, followed by 1 : 2000 corrosive sublimate with 1 per cent. citric acid on swab. During the treatment the membrane spread and covered, besides both tonsils, the soft palate on both sides, anterior and posterior pillars, and the left and posterior wall of the pharynx. As soon as the strong dioxide arrived the above treatment was stopped and a 50-volume hydrogen dioxide solution was applied every two hours by day and every three hours by night for three days; then the intervals between the treatments were increased. After the culture made for diagnosis, no subsequent culture, unfortunately, was made until the twenty-sixth day of the disease. No bacilli were then found or afterward. This patient was discharged from the hospital two weeks earlier than Case I., and entered, as above stated, more than two weeks later.

One case of diphtheria, in which a *complete* use of the strong hydrogen dioxide acid solutions was made:

CASE III.—This case entered the hospital a month after Case I. Klebs-Loeffler bacilli found in the cultures. The membrane was everywhere, on tonsils, palate, uvula, pharynx, both sides and back, and in nose—a case which justified the old-fashioned term of putrid sore-throat. A 50-volume hydrogen dioxide solution was applied in spray every three hours during the day and twice during the night for five days; a 25-volume solution was then substituted which was applied three times during the day. No bacilli were present in a culture made on the eighth day of the disease nor at any subsequent examination. The throat of Case III. was free from bacilli two weeks earlier than Case I., although the patient entered the hospital a month later than Case I.

An estimate of the advantage in using the 50-volume solution, in point of the duration of the bacilli, is shown better by comparing the average time during which the bacilli remained in the throats of the milder cases which were treated with a 10-volume solution of hydrogen dioxide alone, or in connection with a solution of chlorinated soda or corrosive sublimate, with the average time during which the bacilli remained in the throats of patients more severely ill, but who, on the other, hand were treated with 50-volume hydrogen dioxide solutions. Most of both sets of cases occurred during about the same months.

In the first class of cases, twenty-three in number, the bacilli were found on the average to be present in the cultures on the twenty-seventh day of the disease and absent on the thirty-sixth day of the disease. No cultures were made between the two periods from which these averages were made up. The average age of these cases was seventeen years. In the second set of cases (severer ones), namely, those treated with

strong hydrogen dioxide acid solutions, twenty-six in number,[1] the bacilli were found on the average to be present in the cultures on the twelfth day of the disease and absent on the 18.8 day of the disease. No cultures were made between the two periods from which these averages were made up. The average age of these cases was 19.4 years.[2]

It is hardly necessary to point out that the strong dioxide would probably have driven the bacilli from the throats of the milder cases sooner than it did from the severer ones.

In two-thirds of the twenty-six cases treated with strong hydrogen dioxide acid solution the *bacilli* disappeared *before* the *membrane;* in the remaining third this point was not determined. The patients were not discharged from the hospital until both bacilli and membrane had disappeared.

The capacity of a hospital for the treatment of diphtheria would be increased by using the local treatment with strong hydrogen dioxide solutions rather than those ordinarily employed, as the patients would remain in the diphtheria ward a shorter time.

The *diminution* of the bacilli in the throat under different treatments may be studied in some cases by examining a cover-glass preparation under the microscope made from swabs taken directly from the throat. This was done in a few cases only. After a patient had had, for example, a 10-volume hydrogen dioxide solution for ten days, bacilli of diphtheria and other organisms were readily found. In cases treated with 50-volume hydrogen dioxide solution examined in the same way from two to seven days after beginning treatment, very few organisms of any kind were found; bacilli were, however, found in the cultures in these cases for a longer period than in the cover-slips; these examinations show the marked and rapid diminution in the number of bacilli under the treatment by a 50-volume hydrogen dioxide solution.

The following case is one of those which illustrate how the 50-volume hydrogen dioxide acid solution may kill the diphtheria bacilli in a wound.

A patient ill with diphtheria had a contused wound, which was incised and the pus let out. A swab was taken from the wound, and the culture made from it was an almost pure culture of diphtheria bacilli. The flaps of thick dead skin were trimmed off, leaving an open wound about an inch in diameter covered with pus. The wound was cleansed with a

[1] These cases are twenty-six of the thirty cases formerly taken up; of the four remaining cases, two died and two had no bacterial test applied before discharge, therefore they could not be taken into consideration here.

[2] Since this was written I have used 0.5 per cent. salt-solution in eleven cases. In these the bacilli were found to be present on an average on the 26.3 day of the disease, and absent on an average on the 35.4 day of the disease. No cultures were made between the two periods from which these averages were made up. One of these eleven cases had what may be described as a raw-beef throat, a condition which lasted nearly as long as the bacilli remained in the throat, which was six weeks.

50-volume hydrogen dioxide acid solution on a mop and covered with gauze moistened with a 10-volume solution. Four hours later the gauze was removed, and a second swab taken; no diphtheria bacilli were found, only staphylococci. That the diphtheria bacilli were killed by the 50-volume hydrogen dioxide solution and the staphylococci were not, is in accord with the laboratory tests.

Since this paper was read I have used by the kindness of Dr. H. W. Cushing in certain patients in his service (surgical) the strong solutions of hydrogen dioxide, usually 25, sometimes 50 volumes, freely upon large granulating surfaces of burns and ulcers. When they were so situated that the strong dioxide solution could be poured into a cup-like depression of the granulating surface this was done, and the dioxide allowed to remain some minutes; it was then washed out and more strong dioxide solution poured in; this was repeated several times. The strong solutions should not touch the skin. The granulating surfaces were cleansed in this way daily for weeks without causing the patients any discomfort, and they were dressed with a dilute solution of hydrochloric acid ($\frac{1}{10}$ or $\frac{1}{5}$ per cent.). All healed well.

Let us now consider the method of applying the strong hydrogen dioxide solutions.[1]

The Strength of the Applications. This depends upon what one wishes to accomplish, and should vary with the conditions which present themselves in the individual case; ordinarily from twenty-five to fifty volumes, according to circumstances, containing about $\frac{1}{10}$ to $\frac{1}{5}$ per cent. of acid, should be used. If there is much membrane, and especially if the case is septic and in the early days of the disease, the full 50-volume strength is needed. One should not omit to treat the nose and keep it clear, but a separate atomizer should be used for this purpose; in spraying the nose only very weak solutions, one or two to five volumes, should be used. The spray should be directed horizontally into the nostril and not upward. In the posterior nares the strong solutions may be employed by means of an up-spray; the formation of much foam after the application of the solution to the latter parts indicates the presence of membrane. The nose should not be blown strongly directly after spraying. It is very important to know the acidity and strength of the solutions of hydrogen dioxide, and the value of the treatment cannot be properly estimated unless analyses of the solutions are made. The

[1] How not to use the solutions of hydrogen dioxide in diphtheria is very well illustrated, I think, by some cases that were brought to my attention since this paper was read. A solution of hydrogen dioxide in ether, known as pyrozone, was used to make the hydrogen dioxide solution. The manufacturers claim that these solutions are nearly neutral; in other words, an important germicidal element, the acid, is left out, the special property of the hydrogen dioxide itself being the disintegrating power. Second, the air-pressure used in the atomizers was too great. The air was pumped up to a pressure of eighty pounds, then allowed to run down to thirty pounds, and again pumped up to eighty pounds. The air-pressure should not be more than six or eight pounds.

different makes vary in the amount of acid and hydrogen dioxide they contain.

The most efficient mode of application is by means of a gentle spray under an air-pressure of six to eight pounds—just sufficient to carry the solution to the desired spot; this avoids dilution better than when the applications are made on a mop, although sometimes a mop answers as well, and it is easier for the patient.

The discomfort of all local applications is usually greatest during the early days of the disease, when the throat is most sensitive and most congested, but at this time treatment is most serviceable. Later in the disease when the false membrane is clearing off, and if a sensitive, raw, congested surface is exposed, especial care should be taken to avoid these sensitive areas or to use the dioxide solution on a mop. One should be careful not to cause bleeding. The applications, especially in spray, should be made most gently. If the mop is used, the solution causes much less, sometimes no discomfort. The amount of discomfort is, in some instances, an indication of the want of skill in making the applications. While the smart of the strong dioxide is usually greater at the time than that of some of the other applications which are made to the throat, it is only momentary; patients invariably prefer the strong hydrogen dioxide solutions to chlorinated soda solutions of efficient strength. I recall some patients who spoke of the pain the strong dioxide solution caused, and I therefore tried, without their knowledge, spraying their throats with water, and often they did not distinguish between the two. It is the friction of the spray which I think largely causes the discomfort, and some throats are more sensitive than others and some patients more nervous. The majority of patients do not mind the strong dioxide solutions; many ask to have them applied oftener, on account of the relief which follows their use. In an adult, where the nose was closed with false membrane and the tonsils so much swollen and covered with false membrane as to cause cyanosis, the throat was cleared in a few moments by the use of the strong hydrogen dioxide solutions, and the breathing was thus made perfectly easy, although a few moments before tracheotomy had been considered.[1]

[1] That the 50-volume hydrogen dioxide solutions are harmless when properly, even if very frequently applied, is illustrated by the following case, although before outlining it I should say that I do not consider it justifiable to use any local treatment hourly through the night.

B. R., a girl fifteen years old, nursery maid in a family where two children had just died of diphtheria, was sent to the hospital, probably about the first day of the disease, the family being on the alert for any symptoms of diphtheria. Clinically, the appearances in her throat were those of diphtheria, the false membrane covering nearly the whole surface of both tonsils. Unfortunately, no culture was made from the throat when the patient entered the hospital, and the swab taken next morning, after the strong dioxide solution had been applied a number of times, gave no bacilli of diphtheria, only staphylococci and streptococci: and that taken four days later, only staphylococci. There was a trace of albumin in the urine. A new house officer began his service on the afternoon of this patient's arrival, and, through a misunder-

THE NUMBER OF APPLICATIONS.—The strong hydrogen dioxide solutions should be applied often during the first few days; by often I mean once every two hours by day, and twice during the night for the first night or two in severe cases. It will be found, after a few days, in some cases after two or three, that the diphtheria bacilli are much diminished in number or have even disappeared from the throat, although much false membrane may remain. Their disappearance can only be determined by cultures; false membrane in the throat is not a proof of the presence of the bacilli of diphtheria; it may be due to other organisms. No matter how much membrane there may be in the throat, we may be much relieved when the bacilli have disappeared from the cultures. When this has taken place local treatment should be omitted, except to give comfort to the patient by clearing the throat.

I am inclined to think that the persistence of the Klebs-Loeffler bacilli for more than a week or ten days, under the strong hydrogen dioxide treatment, is due usually to their being concealed in the folds of mucous membrane or in pockets which have been made by the inflammatory process, especially in the tonsils, and that the attention should be directed to the application of the solution to these hiding-places carefully and thoroughly.

I observed that in some cases of diphtheria the false membrane persisted under the use of the 50-volume hydrogen dioxide acid solution for some time after the Klebs-Loeffler bacilli had ceased to be present in the cultures; staphylococci were however present. This led me to study the action of the 50-volume solution upon the staphylococcus and to find that it would not kill this organism readily in the beaker. It will be seen in Table V. that a 100-volume hydrogen dioxide (1 per cent.) acid solution is required to kill the staphylococcus in five seconds. Further I found that chlorinated soda would kill it in the beaker quickly (ten seconds) and that clinically the false membrane that had persisted under the use of a 50-volume solution yielded (I have used this in a few cases only) under the alternate use of the 50-volume solution and a solution of chlorinated soda containing from 1–1000 to 1–500 available chlorine.

The local treatment of membranous throats may, therefore, be best carried on with the microscope and culture-tube in one hand and the remedies in the other. As soon as the bacilli of diphtheria have disappeared the strong dioxide should be omitted, except as a cleansing, deodor-

standing, the 50-volume dioxide solution was applied every hour through the night, and until my visit in the morning (making about eighteen successive hourly applications), when I reduced the frequency of the applications to once in three hours by day, and directed that she should be waked once at night for an application. The patient did not make the slightest objection to the frequent treatment, and, so far as I could see, only good had resulted from it. The congestion was lessened and the false membrane covered very much less than its original area, and by afternoon—twenty-four hours after entrance—was nearly gone; traces of it were then seen for the last time. This was more rapid in its disappearance than in any other case I have seen.

izing,[1] or disintegrating agent. If we find that the organisms present are chiefly staphylococci, we may substitute chlorinated soda for the strong dioxide, or use them alternately—they should never be mixed nor used too near together, or we may use hydrogen dioxide and carbolic acid mixed together. The 50-volume dioxide does not kill the staphylococcus readily in the beaker; it will not therefore in the throat.

It follows from what has been just said that in treating pseudo-diphtheria where staphylococci are present we may use hydrogen dioxide solution as a disintegrating agent and chlorinated soda and carbolic acid as germicides.

The streptococcus pyogenes is quickly killed in the laboratory by very dilute hydrochloric acid; in the throat this should be combined with hydrogen dioxide.

In passing let me add a word of caution as to the use of alkalies in diphtheria. Many practitioners prescribe lime-water in diphtheria, and many are in the habit of prescribing some simple local application containing bicarbonate of soda, such as Dobell's solution, in a case of sore-throat. Such alkalies seem to me disadvantageous in diphtheria, as they favor the growth of the bacilli and the formation of their poison, and we should, therefore, be careful to avoid them in this disease or where there is a suspicion of the disease. It seems better to have the diseased parts bathed in acid—not alkaline—solutions.

The instruments which I have designed and found efficient for applying the hydrogen dioxide solutions are, first, three glass atomizers, which can be readily sterilized by boiling. One of these has a down-spray, the second a return-spray, and the third an up-spray. The latter (see Fig. 1) may be used to direct the spray to the side and upper portion of the pharnyx or to either tonsil without taking it out of the mouth, simply by turning it in the hand. A spray is best applied to the surface of the tonsils if directed at right-angles to it. This can easily be done with this atomizer, which I find indispensable. The rubber bulbs of these atomizers have two valves. I also use an atomizer with a straight spray. The atomizer for spraying the posterior nares from behind forward (return-spray) is made by bending the atomizer shown in Fig. 1 through ninety degrees one-half an inch from its tip.

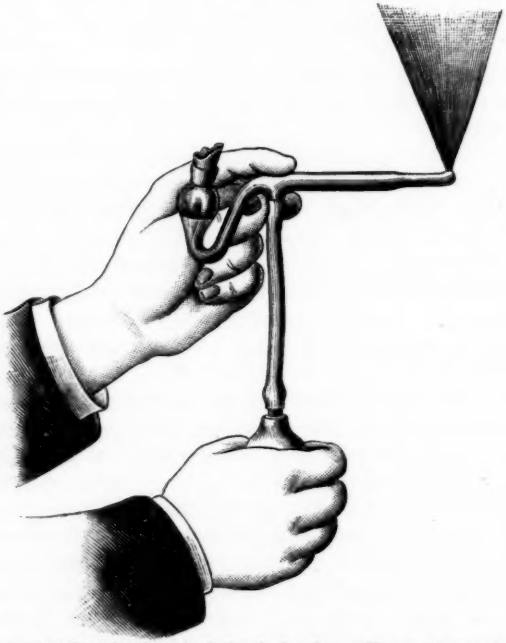
The mop which I use for swabbing the throat consists of a small glass rod on which some absorbent cotton has been twisted. The rod is about eight inches long and one-eighth of an inch in diameter, and is bent at an angle of about forty-five degrees half an inch from the end, in order that the sides of the pharnyx may be more easily reached.

[1] A 5 per cent. solution of permanganate of potassium is frequently used as a deodorizer; a saturated solution contains about 6 per cent. of this substance; this would correspond as a source of oxygen to about a 6-volume solution of hydrogen dioxide.

The end of the rod is rounded and thickened a little by heating in a flame, as by this device the cotton is held more firmly.

To make the applications with success we should not only have good instruments but also the co-operation of the patient; it is a mistake to use force—I do not mean that young children should not be held in a position to let a good light fall into the throat, but the mouth should not

FIG. 1.



From the thumb to the point the tube is five inches long. The up-spray is shown in this figure. The top-shaped bulb should not be filled more than one-half full. The mouth of the bulb may be loosely closed with a small roll of gauze (not absorbent cotton) to prevent spattering. (Made by McElroy, East Cambridge, Mass., U. S. A.)

be forced or pried open. One can nearly always gain the co-operation of children who are four or more years old (and I have used this treatment on children two years old who took it satisfactorily). If one begins tactfully, it is surprising to see how soon young children accept the habit of having the throat treated. It is not necessary to have the head lifted from the pillow. In order to accustom the patient to open the mouth properly I sometimes go through the manipulations of treatment once or twice with water instead of the remedy. It is very important to have the part which is to be treated well lighted, so that one may see exactly

what is *required* and also what is *done*. If the physician does not apply the treatment himself, he should see it done whenever he can. At night a very small kerosene lamp with a reflector, which also shades the eyes of the physician, a necessary condition to success, is good. I sometimes use a small electric light with a portable battery. It is not easy to apply local treatment properly in the throat, and the best results can only be obtained when great care is taken.[1]

In looking over what I have written it seems to me necessary to add some details essential to success in carrying out the treatment with strong hydrogen dioxide acid solutions, as there seems to be so much misconception about them as well as about the ordinary 10-volume solutions. Neutral solutions do not keep well and alkaline ones decompose readily. The hydrogen dioxide solutions which are sold in the market all contain some acid which increases their germicidal value and assists in preserving them.

The strong solutions of hydrogen dioxide may be made by evaporating the 10-volume solution (*U. S. Pharmacopœia*, 1890) in a porcelain dish over a stove or Bunsen burner; in this way one may, if one desires it, obtain a liquid containing 90 odd per cent. of hydrogen dioxide. A 50-volume solution (about 16 per cent.) of hydrogen dioxide may be readily obtained by evaporating a good 10-volume solution to one-sixth of its weight; a 25-volume solution by evaporating a good 10-volume solution to one-third of its weight.[2]

In making the strong solutions it is not necessary to add any acid, as but little of that present in the solution is lost, and 10-volume solutions

[1] In the various inflammatory conditions of the throat, especially, for example, in measles and scarlet fever, it seems to me that there would be less tendency for the inflammation to extend along the Eustachian tube to the ears if pains were taken from the beginning to keep the throat and nose as clean as possible by means of solutions of hydrogen dioxide of suitable strength.

[2] If there were no loss of hydrogen dioxide during the evaporation, this process would yield a 60-volume solution, but about 20 per cent. of the dioxide is lost; therefore, in making a 50-volume solution it is necessary to evaporate a 10-volume to one-sixth instead of one-fifth of its weight. In making solutions of greater strength, the loss would be rather more; in making those of weaker strength, say 25 volumes, the loss would be less than 20 per cent. There is no economy in buying a solution that has not been well made, as it does not keep well and loses more on evaporation than a good one. The time required to evaporate 190 grammes of a 10-volume solution (*U. S. P.*, 1890) to 32 grammes (an ounce) of 50-volume solution is half an hour. One may carry on the evaporation at a gentle boil at the rate of about 6 grammes (one drachm and one-half) per minute.

For commercial purposes the strong solution can doubtless be made with a smaller amount of loss. I simply suggest how, in the emergency of diphtheria, one may quickly obtain a strong solution. Usually I make some ounces at one time.

In the solution of the Oakland Chemical Company the free acid seems to be chiefly hydrochloric, and this is the acid which I now prefer; it is a better germicide than sulphuric acid, although not so good as nitric. Hydrogen dioxide solutions keep better in cool than in warm places; they decompose more rapidly in sunlight.

I have lately made twenty-six experiments, extending over periods of from four to twenty-six weeks, upon the keeping-qualities of hydrogen dioxide solutions of strengths varying from 10 to over 100 volumes, and these tests show that the strong hydrogen dioxide solutions of 25 and 50 volumes of good make are sufficiently stable to be perfectly practicable.

containing 0.03 per cent. of acid when evaporated to one-sixth of their weight contain about 0.18 per cent. of acid, and this is as much as is required for use in diphtheria.

Let me remind you in passing that the gastric juice contains 0.2 per cent. of hydrochloric acid; as this amount does not injure the lining membrane of the stomach it could hardly injure the throat when applied for a short period only.

Hydrogen dioxide is a bleaching-agent, and should not be brought into contact with the hair or colored fabrics. One should avoid getting the strong solution on the skin, as it may after a few minutes whiten it and cause a pricking sensation. It is probable that it attacks the dead outer layer of the epidermis, and hence the white appearance. A minute portion of the solution may get into some small cavities of the skin, and the oxygen gas be there liberated, thus causing pressure on the endings of the sensitive nerves.

Bromide of potassium is of much service to adults during the first few nights, as they are very anxious when they find they have so severe a disease as diphtheria; children do not need it, as they go to sleep directly after treatment, or if asleep are frequently not fully awakened by the treatment.

In many cases of retraction much relief follows the inhalation of steam or calomel fumigations.

There should be abundant and dry air in the patient's room and abundant and direct sunlight. Sunlight is especially advantageous in a diphtheria-ward on account of its excellent germicidal properties, and every room in a hospital for such patients should have this. The simplest construction will permit these conditions to be fulfilled. The building should run north and south, so that every bed may have sunshine part of the day. Overcrowding is extremely harmful.

The utmost attention should be paid to the nourishment of the patient; if too little food is taken by the mouth, it should be supplemented by feeding in other ways, as by the rectum or by means of a soft catheter and a funnel. The catheter may be inserted gently through the nose into the œsophagus and liquid food may be poured into the funnel.

Good food, absolute rest, protection from draught or from a temperature that might give the patient a cold, are to be insisted upon. In some cases stimulation is necessary. Strychnine, digitalis, and iron should be used when required.

The mortality from diphtheria differs in different cities (in recent years it has been very much higher in Boston than in some other cities) and in different institutions, and may differ in the same institution during the same period of time; these variations, I believe, *usually* depend not so much upon the special medical treatment employed as upon the state

in which patients are admitted and the conditions which surround them after admission; by this I mean the ventilation of the ward, the amount of sunlight, the care taken in regard to the cleanliness of the instruments, exposure to other diseases, etc. The milder cases recover if no harmful treatment is employed.

At the Boston City Hospital there are two buildings for the scarlet fever patients, one belonging to the hospital, which is used for acute cases of scarlet fever, and the other, a wooden building, placed at the disposal of the hospital less than a year ago, which is used for the convalescent cases of scarlet fever. Diphtheria has developed in both buildings, but in the first the cases have usually been mild in character; in the second, the building for convalescents, they have been severe, among the most severe and fatal we have had at the hospital. The two buildings are erected on land that is only a few feet above high-water mark, but in the building that does not belong to the hospital the damp ground is not covered with cement, as is the case in the other building.

I have used the strong hydrogen dioxide acid solutions in over one hundred cases, which varied in age from two to sixty-eight years; some were cases of pseudo-diphtheria, and others were hopeless cases of diphtheria, in which it was used to give comfort to the patient by getting out membrane from the throat, so that swallowing was made easier, or to keep down the septic odor; again, others were cases that came under treatment early in the disease.

The 50-volume solutions fulfil the conditions sought; they will kill the bacilli of diphtheria in the laboratory in five seconds, and are not poisonous; they are readily decomposed into oxygen and water; they prevent the septic odor and take off certain portions of the false membrane better than anything else I have employed; under their use the congestion and glandular tenderness and enlargement are more quickly diminished, and the bacilli remain for a shorter time in the throat. Not only is the course of the disease shortened, but also the convalescence is conspicuously rapid compared with the cases under my care before I used this treatment. The patient is thus for a shorter time a menace to those around him, and the danger of the spread of the disease is much lessened. There is conspicuously less tendency to cardiac weakness.

In studying the effect of any local treatment upon the mortality, it seems to me that we should consider chiefly the cases in which the treatment has not been delayed too long—say, not beyond three days.

I will, therefore, discuss here two series of cases of membranous throats, occurring in different years, that were treated with strong hydrogen dioxide solutions, and comply with this condition. There were eighteen in the first series and thirty in the second series—forty-eight in all. During the first period there were, in all, twenty-three cases of membranous throats, the diagnosis of which was not based on cultures

that entered the hospital within the first three days of the disease, so far as known. Five of these do not concern us, as they were not treated with strong solutions of hydrogen dioxide, but, being operative cases, were transferred directly from the medical to the surgical side of the hospital, were there intubed, and died two days after entrance. The remaining eighteen make up the first series of cases treated with strong hydrogen dioxide acid solutions within the first three days of the disease. One of these eighteen cases died; this was a laryngeal case at entrance.

During the second period there were, in all, forty cases of diphtheria, the diagnosis of which was based on cultures, that came under my care within the first three days of the disease. Ten of these cases do not concern us, for the following reasons: Seven were mild or very mild cases that recovered and were not treated with strong hydrogen dioxide acid solutions. The eighth was a child who entered the hospital on the *second* day of the disease, but on account of extreme homesickness did not have any treatment until the *fourth* day of the disease. She was then treated with the strong hydrogen dioxide acid solutions, and recovered. The ninth and tenth cases were not treated with the strong hydrogen dioxide solutions until after three days, as there was none in the ward for a time, or it was deficient in strength. These two cases died. The remaining thirty cases of diphtheria, making up the second series of cases under discussion, were treated with strong hydrogen dioxide acid solutions within the first three days of the disease, so far as known. Four-fifths of these thirty cases entered the hospital during the months in which the mortality from diphtheria in Massachusetts is greatest. Of these thirty cases two died. One was a woman, twenty-four years of age, who was vaccinated a few days before the attack of diphtheria began, and the solution used in this case was found to have been far below 50 volumes in strength. (In private practice I always test the solutions before using them.) The patient, some years before, had lost a brother and sister with diphtheria. The other was a child, four years of age, who took the treatment well for one day, but became delirious the next day, so that further treatment was impracticable, and died the following day.

It gives me pleasure to testify here to the careful manner in which the house officers and nurses carried out my instructions in regard to these patients.

I have used the strong hydrogen dioxide acid solutions at the Boston City Hospitals during the years 1892, '93, and January, 1894, six months in all, as well as in private practice, and have used them with increasing satisfaction.

In closing this paper, I wish to emphasize the importance of the early diagnosis of diphtheria, and, if the treatment be local, of prompt, gentle, and thorough treatment during the early days of the disease with

strong hydrogen dioxide solutions of known strength, containing a proper amount of acid, applied with efficient instruments.

Eighteen Cases of Diphtheria Treated with Antitoxin.

Since this paper was read I have used antitoxin (Behring's and Aronson's) in eighteen cases of diphtheria. Four of these cases were mild, and recovered; seven were neither mild nor severe, and recovered; in these cases the antitoxin was given in the early stages of the disease; four were severe; three of these recovered and one died; in this case the antitoxin was given about the fifth day of the disease; three were hopeless cases when the antitoxin was given; these died. Excluding the four cases that died and the four mild cases there remain ten cases; four of these had paralysis, four some form of eruption like measles or urticaria, three suffered from pain in the bones, and two with swelling of the joints. The two latter cases I will outline briefly:

A. B., aged twenty-five years. As this patient had a child ill with diphtheria, I gave her 1 c.cm. of Aronson's solution as a preventive, but this did not prevent. Six days later she complained of a sore-throat; on the following day there were much congestion and swelling of the tonsils and pharynx, and there was a patch of false membrane on the right tonsil and posterior wall of pharynx. Temperature 102°. A culture made from the throat showed the presence of diphtheria bacilli. I injected 10 c.cm. of Behring's solution No. 2. On the day thereafter the false membrane had spread to the left tonsil, but within three days the throat was nearly clear and the congestion almost gone. On the seventh day of the disease no bacilli were found in the culture. The patient did remarkably well until the twelfth day, when she complained of pain in the left shoulder, back, and left leg; on the thirteenth day the pain was in the left shoulder, right wrist, and occasionally in the back. Hemorrhagic spots one-quarter of an inch in diameter and surrounded by a swollen area half an inch wide appeared, two on the palmar surface of the right hand and one on the palmar surface over the first phalanx of the third finger of the left hand, and one on each heel. These were very tender to the touch. The temperature had been normal for several days, but on this day there was a rise of temperature to 102° both morning and evening. On the fourteenth day the pain disappeared except from the finger. On the fifteenth day intense pain came on suddenly in the left arm, and for several days thereafter the pain returned suddenly during the afternoon and evening. From one-half to one grain of morphine was needed to relieve it. The extremities of the ulnar were swollen and the parts were hot and tender. Salicylate of soda, ten grains hourly, gave no relief, although physiological symptoms were soon produced. Iodide of potassium seemed for a few days to give some relief; there were less tenderness and swelling. The arm and hand were covered with cotton, and were kept on a splint extending from the elbow to the finger-tips. About the twentieth day of the disease the wrist and hand were much swollen and very painful; hot poultices gave more relief than anything else that was used locally. The pain was, as a rule, not severe during the day, but during the afternoon or at night morphine was required for about

three weeks. Five weeks after the attack of diphtheria began the patient was more comfortable, although there was still some pain.

T. H., aged five years. Seen once in consultation with Dr. C. D. Sawin, of Charlestown. Dr. Sawin had given the patient 25 c.cm. of the New York solution of antitoxin before I saw him. I injected 10 c.cm. of Behring's solution No. 2, and subsequently Dr. Sawin gave 20 c.cm. more of the New York solution; the total amount of antitoxin given being 55 c.cm. On the ninth day of the disease there was a well-marked rash, followed on the eleventh day by urticaria with intense itching and great restlessness. On the fifteenth and sixteenth days the rash reappeared with swelling of the phalangeal joints and left elbow; also the right great toe, with inability to move any of the parts without considerable pain and discomfort; on the nineteenth day the patient was able to move the hands readily, but there was some difficulty in moving the left leg, while the right leg was almost useless, rash gone.

The rapid loosening of the false membrane may be a source of danger, as the following cases illustrate:

T. M., aged five years, well developed and in excellent condition. Bacilli of diphtheria were found in culture. I injected 10 c.cm. of Behring's No. 2 solution subcutaneously into the thigh. All other treatment was omitted. In the afternoon thereafter the patient was rather sleepy. On the morning of the third day, that is, twenty-four hours after the injection of the antitoxin, the patient's general condition had improved; in the afternoon the area of false membrane was smaller, and it was loosening and coming off. I took away with the forceps a piece of false membrane, one-half by three-quarters of an inch, which was hanging by a thread in front of the uvula, as I feared that it might be drawn into the trachea and choke the child. Twelve ounces of milk and two eggs were taken on this day. The urine was small in amount, and passed only an ounce at a time. Two loose dejections in the afternoon. The general and local improvement during these twenty-four hours was marked, and more rapid than usual in patients in her condition. On the fourth day the patient ate and slept well. There was less false membrane; a little remained on the right anterior pillar, and there was a small spot about an eighth of an inch in diameter on the left tonsil. Less congestion and swelling. On the fifth day the throat was nearly clear of membrane; only a small area remained on the right tonsil. Patient in excellent condition. I did not see her again, as my service was at an end; but by Dr. Withington's permission I give a further record of the case. On the eighth day the throat was clear of false membrane, and she was doing well. On the ninth day a rash of scarlet fever appeared on her chest, and spread all over the body. She vomited several times. On the eleventh day the respirations were from 50 to 60 a minute; but careful examination of the lungs and heart did not reveal anything else abnormal. On the fourteenth day there were bacilli still in the throat. On the seventeenth day the bacilli were absent. She stopped desquamating on the thirty-eighth day of the scarlet fever. Internal strabismus of the left eye was noticed about the fiftieth day of her illness. This disappeared in about two weeks.

S. E., a well-developed child, aged four and one-half years, whom I saw in consultation with Dr. H. W. Broughton, of Jamaica Plain.

When I first saw her the temperature was 102°, pulse 120. The local symptoms were severe; there were much congestion and swelling; both tonsils, the uvula, both sides and the posterior wall of the pharynx were covered with a thick, false membrane, and there were complete aphonia and croupy breathing. I injected 15 c.cm. of Behring's solution of antitoxin, No. 3 (the strongest)—5 c.cm. in each of three places on the outside of the thigh. On the third day of the disease, twenty-four hours after the injection of the antitoxin, the false membrane had begun to loosen and looked moister. During the day the throat was sprayed twice with a 25-volume solution of hydrogen dioxide, which assisted in removing the false membrane from the pharynx. The improvement by the afternoon of this day was unquestionable; barring accidents the patient seemed likely to recover, although thirty-six hours before her recovery seemed doubtful. At 9.15 P.M. of this same day Dr. Broughton sent for me again, as the child had difficulty in breathing, and there was marked retraction. It seemed as if tracheotomy might become necessary directly. Dr. Broughton gave the child a teaspoonful of ipecac as an emetic, and three or four minutes later she got up a piece of false membrane one-quarter by one inch and a half long, and the breathing improved immediately. Abont half an hour later a small amount of mucus was vomited. Evidently the false membrane was separating in the larynx as it had done in the pharynx. It seemed to me now that tracheotomy might be avoided. This early loosening of the false membrane in the pharynx (as seen in T. M.), by which this membrane may get into the windpipe and choke the patient, and the rapid loosening of the false membrane in the trachea, is a danger about which one must be on one's guard in using antitoxin. Dr. Broughton remained at hand during the night, and every preparation was made for tracheotomy in case it should become necessary; but fortunately it did not. On the third day the temperature was normal, pulse 104, respiration 24. The patient took nourishment well, but spoke in a hoarse whisper. Pharynx almost clear of false membrane. On the tenth day she is reported as doing well, except that she has a whispering voice; up and dressed. Recovered.

The marked and rapid improvement, both local and general, and the very favorable statistics thus far of large numbers of cases of diphtheria that have been treated early in the disease, show that antitoxin is a remarkable remedy, and ways will probably be found to overcome some of the untoward effects that have followed its use. In many severe cases that come under treatment late in the disease, antitoxin does not seem to be of much service, but the reputation of this remedy will incline people to be treated earlier, and this will lower the mortality in this disease. In laryngeal diphtheria antitoxin is our chief reliance.

The syringe (see Fig. 2) which I have designed and use to inject antitoxin is a modification of the one I published in 1892; it is made of glass, and is packed with asbestos, and is joined to the hypodermatic needle by a short piece of rubber-tubing; by this device the antitoxin may be injected with greater ease into a struggling child, and the danger of breaking off the needle under the skin, an accident which may happen

when the needle is rigidly fixed to the syringe, is avoided. This instrument may be sterilized by boiling in water.

In Europe local treatment is recommended to be used with antitoxin. In some of my patients I have used antitoxin alone, and in others I have combined with it local treatment with a 25-volume acid solution of

FIG. 2.

The cut is one-half the actual size. To use the syringe remove the needle, insert the rubber tube into the bottle of serum, and fill half to two-thirds full; put on the needle; next hold the syringe horizontally, and fill the needle with serum; insert the needle under the skin, and inject the serum, holding the handle up; the bubble of air near the piston allows all the serum in the syringe to be injected. When the syringe is made with a square instead of a pointed end this precaution is not required.

hydrogen dioxide in the throat; and in nasal diphtheria I have used in the nose a dilute (2-volume) solution. These solutions may be used every three hours in spray. The loosening and softening action of the antitoxin, together with the disintegrating action of the hydrogen dioxide solution, removes the membrane rapidly, and the hydrogen dioxide solution lessens, if it does not obviate, the danger of pieces of false membrane getting into the trachea from the pharynx.

In treating diphtheria I now usually inject antitoxin and use a spray of hydrogen dioxide of appropriate strength locally in the throat, and a 2-volume solution in the nose once in three or four hours by day.

A CASE OF ACROMEGALY IN A GIANTESS.

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ABOUT the middle of February, 1893, "Lady Aama," a French giantess, was brought to this city to be exhibited in a "museum." A week or so later she was taken ill, and on the 27th of the month her death was reported.

Negotiations were opened with the party under whose escort she was travelling, and her body was secured for the museum of the State University at Iowa City, and an opportunity was thereby afforded me for examining what proved to be a most interesting anomaly.

Owing, however, to the unavoidable pressure of other work at the time of the autopsy and previous to the use of the body in the dissecting-room, I was unable to work out many of the details at all as thoroughly as I should have liked or as the importance of the subject

deserved, and my only excuse for presenting such an imperfect sketch as follows is the great interest and unusual nature of the case.

For the careful measurement of the skeleton and the photographs, I am indebted to the kindness of Dr. J. W. Harriman and Mr. Frank Carroll.

"Lady Aama" had been reported and advertised to be "over eight feet" in height, but this was, of course, recognized as merely the "regulation stature" of all giants thought worthy of an introduction to the public, and it was no surprise to find that her height, or, more properly, length, when carefully measured five days after death, was exactly 6 feet 7¾ inches, though possibly it might have exceeded this slightly during life when the arch of the instep would be better supported and the intervertebral disks unshrunken. The measurements were taken between two uprights standing perpendicular to the table on which the body lay and pressed against the vertex of the head and heel and ball of the foot respectively.

Her baptismal name was Emma Alline Batallaid, and her birthplace on the slopes of the Jura in France, her age being variously stated by her sisters at nineteen and seventeen years, the latter appearing most probable on later examination as scarcely a third of the epiphyses in her skeleton were united with their apophyses, although this may have been a part of the general imperfect development of all her tissues. The "oldest" epiphysis united was that of the lower end at the tibia—eighteenth year (Quain).

The cause of her death was given as "quick consumption" which had lasted for only six months or so, but on more careful inquiry it was found that she had been failing gradually in strength for some four or five years past, and had died quite suddenly. She was exhibited within three days of her death from what appeared to have been an attack of la grippe or of acute bronchitis; death occurring from syncope after a severe fit of coughing. She suffered very little pain during her illness, but the muscular weakness was so extreme that for weeks before her death she was obliged to support herself when standing by holding on to an upright rod fixed in the floor. In fact, her death appeared mainly due to a general state of collapse hastened by an acute coryza.

She was the fifteenth child of a poor laborer, all the others being of normal height (one sister accompanying her and shown in Fig. 1). The latter declared that she was still increasing in height up to the time of her death.

Her intelligence was decidedly poor, but in no way abnormal.

The body was extremely emaciated, and the first thing which arrested the attention was the apparently small size of the chest and trunk as a whole compared with the greatly elongated extremities; this, of course, was merely in accordance with what I believe is the rule in such cases, viz., that the increase in height in giants and the decrease in dwarfs is principally in the limbs, the body being comparatively near the normal standard in both cases.

This impression was found to be correct by the measurements which revealed that the length of the lower extremity from the top of the great trochanter to the lower border of the os calcis was 47 inches, or nearly 60 per cent. of the total height, while the mid-point of the latter usually lies about an inch below this level, upper border of symphysis. (Quain.) According to Blanc's canon (*Artistic Anatomy*, Duval) as

followed by the ancient Egyptian artists, the length of the lower limb from this point should be $\frac{10}{19}$ of the entire height, which in Aama's case would be $41\frac{2}{3}$ inches or $5\frac{1}{3}$ inches less than the actual measurement. The same was found true at the upper extremity (acromion to tip of middle finger), which by the same canon should have been $\frac{8}{19}$ of the total stature, equal to $33\frac{1}{3}$ inches, but actually measured 37 inches.

The same relation is found to be carried out in the measurements of the bones of the chest, the sternum measuring $8\frac{1}{4}$ inches, or barely a quarter of an inch longer than that of the average adult male (Duval) and the clavicle 7 inches or only one inch above the same standard.

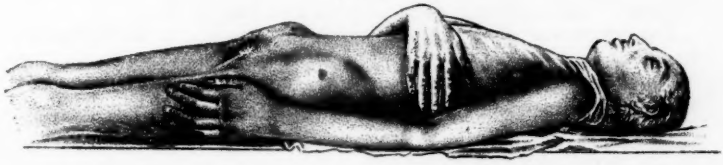
FIG. 1.

The extent to which the excessive height consisted, of length of limb, can be seen by comparing Aama's lower limb with that of the average of her race, which would be $\frac{10}{19}$ of 5 feet 5.2 inches (Quatrefages), equal to 34.3 inches, a difference of 12.6 inches or nearly three-fourths of the total excess of height. The next noticeable feature was the disproportionate size and peculiar shape of her hands and lower jaw,

which are fairly shown in Figs. 1 and 2. Measurements were again found to confirm this impression; the hand, instead of being according to the artistic canon, $\frac{1}{10}$ of the total height, equal to 7.9 inches, was actually 11.25 inches in length, or nearly $\frac{1}{7}$ of the height, and of a peculiarly "spade-like" shape, with long, square-tipped fingers of uniform breadth throughout their length. The foot, instead of $\frac{3}{10}$ of the height, viz., 12.6 inches, measured 13.75 inches; while not only the jaw but also the nasal bones, as shown in Fig. 4, were decidedly enlarged. The lower jaw measured 6¼ inches from angle to symphysis as against the 3¾ inches which is the norm for male adults. The skull proper, on the other hand, was found to be barely above the average size, measuring 21½ inches in circumference as compared with the norm (female) of 20 inches.

There was absolutely nothing in a view of the trunk above the pubes to indicate the sex, the mammary glands being almost completely absent and the circumference of the chest being only two inches less than that of the hips (39 in.).

FIG. 2.



The nipples were flat and small, and upon dissection a mere trace of gland tissue and of a suspensory ligament could be made out. The integument of the body was thickish and earthy-looking, but not otherwise abnormal, and the hair of the scalp was thin and sparse but of about normal length.

Autopsy. I was not able to be present at the autopsy, and it was performed by my prosector, unfortunately without special reference to the possibility of acromegaly.

Emaciation extreme. Heart slightly above normal size. Left ventricle enlarged and dilated valves, and pericardium normal.

Lungs. Normal, except in size, which appeared below the average. Light in color and completely collapsed. No pleural adhesions.

Spleen. Greatly enlarged—weight two pounds. Pulp grayish. Capsule thin and surface lobulated.

Kidneys. Normal; capsule non-adherent.

Liver. Slightly enlarged, but otherwise healthy.

Suprarenals enlarged.

Thyroid gland. Normal in size and appearance.

The brain was pale and sodden-looking, but (owing partly to the fact of its being impossible to make an autopsy until nearly a week after death) in such a degenerated condition that it was difficult to remove it entire.

This was especially marked at the tip of the left temporo-sphenoidal lobe, which was removed as a putty-like mass of débris. From the same cause the pituitary body, which was greatly enlarged, was torn across in removing, and its form and outline completely destroyed.

Its dimensions (reported as "about the size of the last joint of the

thumb"), however, can be judged by those of the fossa—well shown in Fig. 3, which measured 1¼ inches in its antero-posterior and 1½ inches in its transverse diameters.

The weight of the brain (after hardening in alcohol to permit of its handling) was 36 ounces, or 8 ounces below the average (female).

The lateral ventricles appeared somewhat dilated, the tip of the anterior horn being enlarged and rounded and the cavity of the third extended well down into the infundibulum. There were no hemorrhagic patches and the membranes were healthy. The convolutions, fissures, and general proportions were normal, except for a peculiar thickening and compression backward of the temporo-sphenoidal lobes causing the anterior third of the fissure of Sylvius to run almost vertically and the uncinate gyrus to project internally.

The most striking abnormality was found in the generative organs. The mons veneris and labia majora were flat and poorly developed. The clitoris was nearly half an inch in diameter and extremely prominent, and with the large clitoridal folds, 1½ inches in length, presented no very fanciful resemblance to a small and imperfectly developed penis. This probably was the cause of the reports circulated during "Aama's" lifetime that she was an hermaphrodite.

The vagina was small and straight, barely capable of admitting the forefinger.

The uterus was 1¼ inches in length and ⅜ inch broad—about the size and shape of the last joint of the little finger, and weighed two drachms.

The Fallopian tubes were barely recognizable, and their abdominal extremities had only three or four rudimentary fimbriæ (none attached to the ovary). The ovaries were small granular-looking masses about the size of the finger-nail, adhering to the posterior surface of the broad ligament.

The Skeleton. After the removal of the softer tissues the bones were macerated and cleaned, with the hope of being able to mount them for the museum, but such was their spongy, crumbling condition that it seemed doubtful whether they were firm enough to hold the wires and support their own weight. The whole osseous system appeared to be in a condition of osteoporosis; a touch would dislodge the teeth from their sockets, the ribs and slighter bones would snap across at the lightest strain, and the epiphyseal plates upon the bodies of the vertebræ could be lifted off with the finger. In fact, it literally appeared as if there was no more actual osseous material in this gigantic skeleton than would be required to make a sound, firm, bony framework of the average size.

The bones, though much larger, were very little heavier than normal, the radius, scapula, and fibula, for instance, being found to exceed the average of healthy bones in weight only 10 per cent.

The Skull.

Circumference at level of glabella	21½	inches.
Distance between external orbital processes	5⅛	"
Superciliary ridge to point of symphysis	6¾	"
Angle of inferior maxilla to symphysis	6¼	"
Length of nasal bone	1¼	"
Breadth of nasal bone	¾	"
Glabella to occipital point	7¾	"
Breadth index	74	"
Height index	76	"

A most striking illustration of the highly rarefied, not to say cavernous, condition of the bones is seen in the condition of the frontal sinuses

FIG. 3.

View of interior of cranium, showing pituitary fossa and frontal sinuses.

(Fig. 3), which are huge cavities two inches from side to side on the right side and two and three-eighths inches on the left, three-quarters inch

FIG. 4.

Lateral view of skull (nasal bones and upper end at lachrymal groove outlined in crayon).

from before backward, and one and one-half inches in depth, the bony tissues being expanded to a mere shell of the thickness of writing-

paper. The same condition was found in the maxillary antrum, which was actually cribriform in the tuberosity, while the squamous plate of the temporal was so thin that the groove for the middle meningeal artery actually causes a perforation half an inch long on the right side. The zygoma is reduced at one point to the thickness of pasteboard.

Except the great size of the pituitary fossa, the only noticeable alteration of the cranial interior is a peculiar shortening and thickening (antero-posteriorly) of the petrous bars (which can be seen in the illustration), accompanied by an internal auditory meatus nearly double the normal size and placed well down upon their posterior surface. This has almost the appearance of having been caused by the pressure of an enlarged pituitary body during embryonic life, preventing their growth inward and forward and causing them to enlarge laterally. As if this had actually been the case, the carotid canals are considerably larger than normal (three-eighths of an inch in antero-posterior diameter), while the jugular foramina are overlapped by this bulging to such an extent that their diameter, as seen from the interior of the cranium, is reduced on the right side to less than two-thirds of what it is on the under surface of the skull, and on the left side to less than one-third. On the right side a spur of bone projects completely across the aperture, and on the left side it is an elongated, irregular slit.

The large size of the nasal bones—outlined in crayon—and the width of the upper end of the lachrymal groove are seen in Fig. 3. The lachrymal canal is proportionately dilated, measuring at the level of the floor of the orbit no less than three-eighths of an inch in transverse, and one-fourth of an inch in antero-posterior diameters; an ordinary female silver (No. 18 French) catheter can be readily passed down it into the nose.

The crumbling condition of both upper and lower alveolar processes and the looseness of the teeth can also be seen (Fig. 3), many of the fangs being exposed. Both the upper incisors, canine, bicuspids, and first molar on the left side have disappeared, and the alveolus is atrophied, while the remaining teeth are either loose in their sockets or have large cavities in their crowns. An upper plate was worn during life.

Pelvis and Trunk.

Pelvis—

Circumference around crest	38 inches.
Transverse from antero-superior spine to same	15 "
Superior strait	6½ "
Inferior strait	6 "
Depth	7 "
Transverse diameter	6½ "
Antero-posterior diameter	7 "
Symphysis of pubis to tuberosity of ischium	6½ "
Crest of ilium to tuberosity of ischium	11 "
Antero-superior spine to postero-superior spine	8 "
Antero-superior spine to postero-inferior spine	9½ "
Crest of ilium to sacro-sciatic notch	7 "
Length of sacrum and coccyx (internal)	9½ "
" " " " " (external)	10½ "
Long diameter of sacro-sciatic foramen	2¾ "
Diameter of acetabulum	2¼ and 2½ "
Depth of acetabulum	1¾ and 1½ "
Depth of pubic symphysis	2¾ "

Lumbar vertebra (4th)—	
Tip to tip of transverse processes	5⅝ inches.
Body	2¼ by 2⅝ "
Trunk—	
Spine-atlas to end of coccyx, following curves	42 inches.
Sternum-length	8¼ "
Clavicle-length	7 "
Scapula (inferior angle to tip of acromion)	10⅜ "

The sternum presented a central round perforation one-third of an inch in diameter in the third piece of the gladiolus, and the fourth piece was cleft and broadened at its extremity. The acromial epiphysis was in two pieces.

Upper extremity—	
Whole arm and hand	37 inches.
Humerus	15½ "
Olecranon to tip of second finger	23 inches.
Ulna	11⅜ "
Radius	11⅛ "
Middle metacarpal and finger	9⅝ "
Metacarpal (middle)	3⅞ "
First phalanx (middle)	2⅝ "
Lower extremity—	
Head of femur to os calcis	47½ inches.
Femur (head to internal condyle)	23¼ "
From depression for ligamentum teres to outer side of trochanter major	5⅜ "
Width at condyles	5½ "
Greater to lesser trochanter	5¼ "
" " internal condyle	22⅜ "
Circumference of neck	6¾ "
" of head	8 "
" of shaft of middle	5½ "
Tibia—	
Length from internal tuberosity to internal malleolus	18⅝ inches.
Width of tibia and fibula at ankle	4 "
Circumference of shaft (middle)	5⅜ "
Foot—	
Length	13¾ inches.
Depth of tarsal arch	4½ "
Girth of foot	10½ "
First metacarpal (length)	3 "

There was a distinct, bossy, "velvety"-looking elevation of the postero-internal surfaces of both tibiæ in their middle third.

I have ventured to call this case one of acromegaly on the following grounds:

1. The excessive development and peculiar shape of the hands, fingers, feet, jaw, nasal bones, and frontal sinuses.

2. The hypertrophy of the pituitary body and enormous size of the pituitary fossa.

3. The history of mental deficiency and long-standing progressive failure of strength, ending at last in death by syncope.

The enlargement of the pituitary body would appear to be the principal pathological characteristic of this disease, as it has been found to be present in ten out of the twelve cases, hitherto reported, in which autopsies were held. Its probable size in this case would appear to conform pretty closely to the average hypertrophy as reported, which ranges from one inch to one and one-quarter inches in antero-posterior and one and one-fifth inches to one and two-thirds inches in transverse diameter, the diameters of the pituitary fossa here being one and one-fourth and one and one-half inches respectively.

Of course, the interesting question suggests itself at once: What connection, if any, exists between the acromegaly and the giantism? and although the facts at our disposal are so few that any speculation upon the subject must be purely tentative, yet one is tempted to string them together upon some sort of a theory.

In the first place, it is interesting to note that giantism so far as accurately recorded would appear to be actually mainly an "acromegaly" extending to the whole extremity (both upper and lower) instead of merely confined to the last segment, the lower limb contributing such a large proportion of the excess of height. An approach to this condition even is recorded in some of the cases of acromegaly occurring in adult life in which not only the hand but the forearm and leg were enlarged (Pel, Dercum, Long).

Arnold[1] reports a case where the shoulder-girdle was thickened, and Berkley[2] one where the clavicles were enlarged. Dercum[3] records another where forearms, legs, and chest were greatly enlarged. The scapula and pelvis were enlarged in Osborne's[4] case. The forearms, patellæ, and clavicles in Pel's[5] case, and the forearm and leg in Long's.[6] The bones of the leg were thickened in Pechardre's case.[7]

In the four instances above, where the weight was given, the average was 215½ pounds.

Then, again, the picture of the giant given almost unanimously by secular (non-romantic) literature is that of a loose-jointed, weak-minded, stoop-shouldered sort of a being, with splay feet, huge hands, and projecting features.

[1] Beitrage zur Pathologischen Anatomie, Band x., No. 1.
[2] Johns Hopkins Hospital Bulletin, September, 1892.
[3] AMERICAN JOURNAL OF THE MEDICAL SCIENCES, March, 1893.
[4] Ibid., June, 1892.
[5] Berliner klin. Wochenschrift, 1891, No. 3.
[6] Lehigh Valley Medical Magazine, 1891, No. 3.
[7] Revue de Méd., February, 1890.

The condition itself appears to be almost a diseased one, as the vast majority of these "freaks" die young, and from the few actual records obtainable by me none pass middle life. The ages at death which I have been able to find given are:

	Height.	Age at death.
Charles Byrne	8 feet 2 inches.	22 years.
McGrath	8 " 6 "	20 "
Winkelmaier	8 " 9 "	22 "
James Toller	7 "	24 "
Tall girl of Basle	7 "	in childhood.

We must remember that the actual range of human stature even in giants is much more limited than is popularly supposed or even than is usually assumed by most of us; popular literature abounds with nine-foot and ten-foot men, but statures above eight feet are extremely rare, and Du Quetelet even declares that the tallest man reliably recorded was Frederic the Great's "Scottish Giant," who stood eight feet three inches. "Chang," the Chinese giant, was only seven feet eight inches in height, and Patrick Cotter seven feet ten inches, while the majority of "giants" actually barely reach seven feet; and it does not seem at all incredible that the same nutritive disturbance which can add an inch to the hand or jaw of an adult can literally "add a cubit to his stature" if beginning its operation during the fœtal or infant life.

Indeed, the former would, abstractly considered, appear the more remarkable of the two. In adult life the increase merely occurs at the points of least resistance—the ends of the extremities and features, or, as Klebe asserts, the ends of the long bones.

The situation of the characteristic pathologic change in the pituitary body is itself extremely interesting and suggestive from an embryonic point of view.

Little as is known of the function or physiologic relations of this "gland," it is generally regarded as marking the point of junction of the spinal and alimentary canals (neurenteric canal) and termination of the notochord. This makes it the "uppermost" end of that neurenteric loop which bounds the stature of the embryo and, thus developmentally, the "highest" point in the body, so that one would almost expect upon *à priori* grounds to find at this point marked traces of any nutritive disturbance affecting the length or size of the body or appendages.

The connection becomes still more suggestive if we accept Beard's ably supported view that the pituitary and pineal bodies, together with the pineal "eye" in *Hatteria*, represent the remains of the primordial mouth opening axially (from which the present mouth and pharynx are a secondary development laterally), and round which the encephalon developed after the fashion of the œsophageal ganglia in Molluscs,

and "œsophageal nerve-collar" in Crustaceans, to preside over the structures concerned in securing food-materials.

As this is at bottom the primary and essential function of the extremities (including the jaws) we should hardly be surprised to find their nutrition in some way presided over or represented in this region.

Would it not appear probable that at least one form of giantism is merely acromegaly beginning in fœtal or infant life? And that the pituitary body has some title to be regarded as a "growth-centre for the entire body? From the measurements already made in a half-finished investigation of the size and shape of the pituitary fossa in the skulls of cretins and dwarfs it would appear to be almost as markedly contracted in these cases as it is enlarged in giantism and acromegaly. I also find, on comparing the skulls of the anthropoid apes, that the gorilla, who, in jaws, frontal sinuses, hands, feet, and dorsal kyphosis is almost ludicrously "acromegalic," has in five specimens out of six the characteristic large bowl-shaped pituitary fossa and thick "swollen" petrous bars.

NOTE.—Since the abstract of the above was read at Washington, Dr. C. L. Dana, of New York, has reported in an extremely interesting paper (*Journal of Nervous and Mental Disease*, November, 1893) two similar cases. One almost exactly parallel, in an Indian from Bolivia, 6 feet 7 inches in height and weighing 300 pounds, who presented a well-marked case of acromegaly, including enlargement of the pituitary body. He died at the age of thirty years with symptoms extremely similar to Aama's.

The other case was of a giant, 7 feet 4 inches in height and weighing 325 pounds at the age of twenty years, who presented many acromegalic symptoms, including enormous feet and hands, kyphosis, sclerosis, coarse hair, feeble muscular development, and a curious enlargement of the nasal bones and jaws on the left side.

Dr. Dana supplies a valuable "missing link" in the chain of my suggestions, by giving a list of six other cases of the disease in which the height exceeded 6 feet (ranging from 6 feet to 6 feet 4 inches) and the average weight was 242¾ pounds.

While writing the above my attention was attracted by a fact which seemed, even then, of suggestive interest in this connection. It was, however, then almost an isolated observation, but I have since met with several other similar coincidences, and still others have been reported in current medical literature.

This is the remarkable "dwarfing" effect upon both stature and general nutrition which is produced by lymphadenoid enlargements of the pharyngeal tonsils—the familiar "p. n. g." (post-nasal growths) of our

throat clinics—in children, and the rapid increase in bodily size and weight which follows their removel or reduction.

I have had in my own practice during the past two years six cases of children from nine to twelve years of age with post-nasal growths, who were undersized, under weight, anæmic, and generally neurasthenic, and who a year after the removal or absorption of the growth gained from two to four inches in height, and from five to fifteen pounds in weight, with a proportionate improvement of their nutrition, became "different children," in fact, as the parents of several of them informed me.

Of course, I am aware that this is just the period for "growing-spells" in children, and these results may be nothing more than accidental coincidences; but some degree of this same condition and improvement I have seen in every case of post-nasal adenoids which has been under my care during the past two years, and the same singular coincidence has been noted and commented upon by no less accurate and distinguished observer than Solomon Solis-Cohen in one of his clinical lectures.

This change must be a reflex one, for the trifling clearing of the respiratory passages effected is utterly inadequate to account for it, and as the pharyngeal "bursa-tonsil" was originally directly continuous, and is developmentally and structurally identical with the lower lobe of the pituitary body, the suggestion is an alluring one that disease of the former acts by reflex inhibition upon the "somatic-growth" centre in the latter, just as direct disease of the latter seems to be associated with both acromegaly and giantism.

Could this association throw any gleam of light upon that well-known form of malnutrition accompanying enlargement of the faucial tonsil, for which all the explanations so far offered have been so almost childishly inadequate? Their enlargement does not really interfere to any appreciable degree either with deglutition or respiration, and yet it produces a rank crop of thoracic, hæmic, abdominal, and nervous symptoms.

As Harrison Allen has well pointed out, there is really an almost continuous ring of "tonsillar" (adenoid) tissue round the alimentary canal just behind the mouth cavity, of which the superior, lateral, and inferior aggregations are known as the pharyngeal, faucial, and lingual tonsils respectively, and actual investigation has shown that both upper and lower may be enlarged together with the lateral.

REVIEWS.

ECTOPIC PREGNANCY; ITS ETIOLOGY, CLASSIFICATION, EMBRYOLOGY, DIAGNOSIS, AND TREATMENT. By J. CLARENCE WEBSTER, B.A., M.D., F.R.C.P. Ed., Assistant to the Professor of Midwifery and Diseases of Women and Children in the University of Edinburgh. Pp. 233. With 80 illustrations of naked-eye and microscopic appearances. Edinburgh and London: Young J. Pentland, 1895.

ECTOPIC pregnancy is so important and its recognition is attended with such difficulty in complicated cases that a monograph upon the subject from a competent authority cannot fail to be of interest and value.

The writer of the book under consideration has had ample opportunity to study his subject; while his previous contributions to medical literature justify the expectations of the reader that this book will prove of decided value.

He first considers the conditions under which the formation of ectopic pregnancy is possible. He draws attention very clearly to the fallacy of the belief that the lining epithelium of the Fallopian tube is composed of cells favorable for the development of the impregnated ovum. He uses the marked comparison that there is no more reason for supposing that the normal tube can perform the function of the uterus than for believing that the œsophagus can perform that of the stomach. As has been shown by Minot, Hart, and others, this lining of the tube plays an entirely negative part in the development of the ovum. As might be expected from our knowledge of the effects of inflammation in the lining membrane of the uterus, tubal inflammation is unfavorable to the development of tubal pregnancy.

It has been shown by experiment and observation that it is the presence of the ovum which causes any portion of the genital tract to take upon itself those changes necessary for the growth of the ovum, and not the normal structure of the part, which brings about the changes requisite for the development of the ovum.

The author's classification of ectopic gestation is based upon the belief that such cases are all primarily tubal so far as is known. He denies the possibility that the ovum can develop primarily in the peritoneal cavity, for he believes that the cells of the peritoneum will rapidly destroy an ovum.

There is no proof that gestation can begin in a Graafian follicle. Webster's classification is virtually that of primarily tubal pregnancy. His first division is ampullar, by far the most common. Most of these cases rupture, and among the secondary conditions which develop from them is that form of ectopic pregnancy where the ovum is outside the general peritoneal cavity. Among these are also the cases in which the

gestation comes to an end and the embryo is discharged into some cavity of the body by suppuration.

When the cases rupture into the peritoneal cavity, if the membranes remain unbroken the fœtus may develop while the placenta remains in the tube; in other cases the patient dies from hemorrhage or peritonitis, while rarely the fœtus becomes changed and retained indefinitely.

The second variety is that of interstitial pregnancy, while the third class is infundibular; under this last title are included cases described by other writers as ovarian pregnancy.

Webster next studies the above varieties of these cases in detail, illustrating the various forms by woodcuts of frozen sections. His researches show that we are yet without proof that the fœtus can escape into the peritoneal sac free from membranes and develop to full time. He regards pelvic hematocele as caused by ruptured ectopic pregnancy in nearly all cases.

As regards the question of the growth of the placenta after the death of the fœtus, he agrees with Hart in stating that no proof that such growth occurs exists.

In considering the symptoms and signs of ectopic pregnancy the writer calls attention to the fact that these may sometimes be practically the same as in the cases of uterine gestation. There are, however, few cases in which a diagnosis cannot be made by thorough examination. The colicky pains, of which these patients complain, are caused by contractions in the affected tube.

The mammary changes in ectopic pregnancy are less than in normal cases; the movements of the fœtus are usually felt first on one side of the abdomen; the enlargement of the abdomen does not proceed so symmetrically as usual; while, owing to the fact that the tube is higher than the uterus, tubal pregnancy may cause enlargement higher in the abdomen than if the pregnancy were within the uterus.

Where the gestation-sac lies close to the abdominal wall movements can be detected by the stethoscope before the mother feels them, and with greater ease than in cases of normal pregnancy.

Fœtal heart-sounds are often heard with great distinctness. Among the many signs of ectopic pregnancy are the changes in the uterus, and the fact that these changes differ materially from those of normal pregnancy. In ectopic gestation the cervix is not usually so soft, and the uterus increases more in length than transversely or antero-posteriorly. It is a well-established fact that decidua may be expelled from the uterus during the progress of an ectopic pregnancy. Examination of such decidua, however, fails to reveal changes characteristic of normal gestation. Spurious labor is also a symptom of ectopic pregnancy whose determining cause is unknown. It is interesting to note that rupture of the sac during spurious labor is very rare.

In making a diagnosis it is very essential that a thorough bimanual examination be made, and that an anæsthetic, preferably chloroform, be employed. It should also be remembered that an examination through the rectum is often indispensable. It is most frequently found that the uterus lies in front, forming a part of the wall of the gestation-sac within, and easily detected on examination. Diagnosis is obscured by the complications which develop as the case goes on. At first pressure-symptoms are less pronounced than in normal cases, while, as the uterus increases in size, the kidneys may be so displaced as to interfere with their

action and threaten eclampsia. Peritonitis almost invariably develops as the case goes on.

The signs of rupture of the gestation-sac are familiar to experienced examiners, and are clearly described. To make a complete diagnosis of ectopic gestation it must be proved that the uterus is not pregnant, that a swelling exists in the abdomen or pelvis, and that this swelling is caused by an ectopic pregnancy. In addition to bimanual examination under chloroform in doubtful cases, a sound should be introduced, and in addition a scraping of the mucous membrane lining the uterus should be made for examination by the microscope to detect decidual tissue. If this is done with antiseptic precautions, normal pregnancy need not be interrupted by this procedure, while the value of a positive diagnosis can be readily appreciated.

In the treatment of these cases the writer's views may be summarized as follows: All cases which justify interference require surgical treatment; the injection of morphine, use of electricity, and all other non-surgical procedures are considered of no value. The vaginal operation may be performed in those cases in which suppuration has occurred, the fœtus being macerated and the pus pointing downward into the vagina. Other cases require abdominal section. The majority of cases which reach the late months of pregnancy are those in which the ovum growing outside the peritoneum has pushed this membrane up; by carefully selecting the line of incision the peritoneal cavity need not be opened in operating upon these cases.

In tubal pregnancy the writer would remove the affected tube, ligating the ovarian artery and other bleeding vessels in the broad ligament. In cases where the fœtus has gradually escaped into the abdominal cavity, if the sac is intact, the broad ligament should be ligated below the whole mass and the mass removed. No effort should be made to remove the membranes if they are adherent. If the primary sac is firmly imbedded in the pelvis, the ovarian artery on that side may be ligated to lessen blood-supply to the maternal sinuses which supply the placenta, the sac being stuffed with gauze and the cord brought out at the lower end of the abdominal incision. After four or five days the patient should again be chloroformed, the placenta entirely removed, and the cavity again packed. In advanced extra-peritoneal cases there is no question of removing the gestation-sac; it is impossible to do this. In cases where the fœtus is in the abdomen, and the pregnancy has advanced to the seventh or eighth month, it might be thought advisable to allow the patient to go the full time in the hope of getting a living child. The author advises against delay. Such children are weaker than those born normally, and the mother's danger of delay is so great that the life of the fœtus should not be considered.

Webster closes this book with twenty-two plates, all microscopic, from cases of ectopic pregnancy. They are of great value and interest, and serve well to illustrate the book. We know of no treatise upon this subject which so clearly gives the latest and best surgical knowledge upon this important and difficult topic. The publisher presents the volume in an attractive and artistic form. The book will be a decided addition to the library of the obstetrician. E. P. D.

PATHOLOGY AND TREATMENT OF DISEASES OF THE SKIN. By MORIZ KAPOSI, Professor of Dermatology and Syphilis in the Vienna University. Translation of the last German edition, under the Supervision of JAMES C. JOHNSTON, M.D. Pp. 684. New York: William Wood & Co., 1895.

FOUR editions of this well-known work by the distinguished Austrian professor of dermatology, the worthy successor in his field of medicine to Hebra the elder, have appeared in German. The unquestioned ability of the author and the ease with which he expresses himself have made this work justly popular with readers of German, and we believe it will prove so to readers of English, now that it has been translated. The style of the subject-matter is didactic and in the form of lectures, but the matter presented has been duly weighed by the author, so that the result is a solid, systematic treatise on the diseases of the skin. The classification is in the main that brought forward by Professor Hebra fifty years ago. It has stood the test of time, and is championed by the author as being the best that has been put forth up to the present time. It is based on anatomy, pathological anatomy, and etiology, the latter occupying a comparatively insignificant place in the scheme.

The subject is discussed in a scientific, straightforward manner, strictly upon the lines laid down by the Vienna school, of which the author is now the chief exponent. The symptoms, and especially the pathology and the pathological anatomy, of the diseases are considered in detail; but the matter of treatment does not receive so much attention as in the works of most English and American authors. Local treatment for most diseases is more highly esteemed than internal remedies, and tolerably full directions are given in detail for the mode of treating by mechanical and other local means the most obstinate diseases, such as lupus. That internal medication and diet are not much esteemed by the author is plainly evidenced by the observation that in the treatment of acute eczema no internal remedies at all are alluded to, and that on the chronic forms of this disease the subject is very briefly dismissed in the following significant words: "We expect a positive cure from the proper use of local remedies in every case, even when it is believed to be due to other diseases, such as chlorosis, indigestion, chronic catarrh of the apices of the lungs, dysmenorrhœa, etc. In the latter event we also attach great importance to the internal treatment of the underlying disease. To scrofulous children we give cod-liver oil; to chlorotic and dysmenorrhœic women iron, arsenic and iron, or Fowler's solution." In further proof that eczema is looked upon by the author as a local disease, and that in no way in any case is it to be influenced by such therapeutic measures as diet, the following concluding words of this chapter may be quoted: "We are never opposed, in eczema, to the ingestion of salted or spiced food, cheese, caviare, etc., because they increase neither the eczema nor the itching, nor do they produce the mythical acridity of the blood."

The formulæ are expressed either in parts or in the metric system, the English or American reader missing the grains, drachms, and ounces with which he has all his life been familiar. Abbreviations of

the names of drugs are constantly employed, with the result that in some cases the reader is left in doubt as to what is meant; for example, good results in acute eczema are claimed for "compresses of alumin. acet. in the form of Burow's liquor, 5-10 : 100 parts water."

Writers, chiefly those who have done special work, are referred to here and there, but no references are given. The reader who expects to find an array of prescriptions suitable to every stage of the disease being considered will be disappointed, for the author aims to teach principles rather than to give formulæ. The book is scientific and practical, and aims to present the most important features of each disease considered. The author steers clear of any tendency of taking the reader, as it were, into his confidence, by stating that this or that remedy or prescription is infallible in any given disease. The work, as a whole, is the product of a masterly mind. It is full of valuable observations stated in a manner that wins the sympathies of the scientific reader. It is a book that can be read and reread, and consulted with profit, because it contains the convictions of one who has studied closely the vast amount of disease that has passed before his trained and observing eyes.

The translation reads smoothly, and (presumably from the fourth German edition) is free rather than literal, as a comparison with the original will show, while here and there a sentence or a paragraph is abbreviated or omitted. In lichen ruber we note that the translator has not grasped the meaning of the word *Knötchen*, for the lesions characteristic of this disease are called "nodules," instead of papules. In a short preface to the book Dr. G. H. Fox, of New York, directs attention to the professional life and attainments of the distinguished author, and cordially recommends the work to American and English readers. To these friendly sentiments the reviewer would add his own high appreciation of the work as a whole. The book, however, is better suited, both in style and scope, to the practitioner than to the student; and, moreover, is better adapted to the German than to the American physician. The latter remark applies especially to the views enunciated concerning internal therapeutics. L. A. D.

CHIRURGIE DU RECTUM. Par E. QUÉNN and H. HARTMAN. Paris, 1895.

RECTAL SURGERY. By QUÉNN and HARTMAN.

A NEW monograph on the surgical diseases of the rectum, written after long clinical experience and with much candor and fairness, is to be welcomed as a useful addition to surgical literature. There can be no doubt that rectal diseases, like nearly all other forms of disease, require new and special study from the standpoint of bacteriology. The avenues of infection in this region are obvious and numerous, and their consequences are varied in their manifestations and grave in their ultimate results, especially if unrecognized or untreated.

It is, therefore, gratifying to find at least one-third of this work devoted to a consideration of the infectious diseases of the rectum, of which rectal strictures, ulcers, fistulæ, etc., may be considered to be the sequelæ. Indeed, many hemorrhoidal conditions are to be placed in the same category, the two exclusively mechanical theories of causation

being gradually expanded at the present day to admit of new conceptions in which infection plays a prominent part. The practical part of the work is equally to be praised—the description of the course, symptoms, and complications of piles, fistulæ, fissures, abscesses, ulcers, all are admirable.

In many details of treatment the teachings differ from those received by the majority of American surgeons, but a fair consideration is given to each method and the conclusions arrived at are always impartially stated. The injective treatment of hemorrhoids is spoken of by the authors as the "American" method, although the views of American writers who oppose it are also given.

In the treatment of hemorrhoids, great weight is very properly placed on the dilatation of the sphincters, which is said to deserve a place among the curative procedures rather than among the preliminary steps leading to other operations. The experience of Fontan, who had himself a hemorrhoidal fissure, is quoted in support of this view. Excision and ligation and cauterization with the actual cautery are fully discussed.

In the treatment of fissure, dilatation is, of course, assigned the chief place.

The article on strictures contains a valuable table of cases and a very thorough *résumé* of existing methods.

In anal fistulæ they advocate resection and immediate suture. Quénn has been a prominent defender of this plan—theoretically an ideal one—for the last decade, so it is not surprising to find some space given to it in this book. It is to be wished that surgeons everywhere could get the results which he describes.

On the whole, the book is a valuable one from both the analytic and the practical standpoints, and is well worthy the perusal of every surgical teacher and operator. J. W. W.

THE PHYSIOLOGY OF THE CARBOHYDRATES—THEIR APPLICATION AS FOOD AND RELATION TO DIABETES. By F. W. PAVY, M.D., LL.D., F.R.S., Fellow of the Royal College of Physicians, Consulting Physician to and formerly Lecturer on Physiology and on the Practice of Medicine at Guy's Hospital. London: J. & A. Churchill, 1894.

EVER since the discovery of the glycogenic function of the liver by Claude Bernard the disposition of the carbohydrate constituents of the food has been a question of much interest, patient investigation, and controversy. The explanation offered by Bernard appeared to many to be insufficient to account for certain physiological facts or to afford a firm foundation for the erection of satisfactory views as to the pathology and treatment of diabetes.

The glycogenic function may be briefly stated as follows: The glucose into which the carbohydrates are converted by the action of the digestive fluid is absorbed into the blood of the portal vein and carried to the liver, where, by the action of the cells, it is abstracted, dehydrated, and temporarily deposited under the form of the non-diffusible body, glycogen. At a subsequent period, and in proportion to the needs of

the economy, the liver-cells, through the agency of a ferment, again transform the glycogen into glucose and return it to the circulation, by which it is transported to the systemic capillaries, where it disappears, and is presumably applied to the purposes of nutrition. The blood of the hepatic vein, therefore, contains a larger percentage of sugar than the blood of any other part of the body, and the arterial more than the venous blood. Should there be a failure on the part of the liver-cells to abstract the sugar, it will pass into the general circulation, from which it would be eliminated by the kidneys, and a temporary diabetes at least would be established.

These views of Bernard, though widely accepted, have been antagonized by Dr. Pavy in a series of articles based on apparently most accurate experimentation, extending from 1860 to the present time. A summary of all his experiments, with the conclusions deducible from them, are embraced in the present work, which constitutes a most valuable contribution to medical and physiological science.

In opposition to the views of Bernard, Dr. Pavy states that the blood on the cardiac side of the liver never, under normal circumstances, contains more sugar than is to be found in any part of the circulation (excepting the portal during digestion), and which amounts to no more than from 0.6 to a little over 1 per 1000 part. During the passage of the blood through the hepatic capillaries practically all the absorbed sugar is abstracted and converted into glycogen. In this manner the general circulation is shielded from any excess of sugar.

To account for the presence of sugar in muscles, placenta, spleen, and other organs, Dr. Pavy assumed the existence of a carbohydrate compound in the protoplasmic basis of the tissues, which made its appearance, at the time of disintegration or cleavage, under the form of sugar. Landwehr had demonstrated that the albuminoid body, mucin, could be made to yield a non-reducing carbohydrate which by certain reagents is convertible into a cupric oxide reducing sugar. By the employment of various methods Dr. Pavy has been enabled to demonstrate the glucoside constitution of proteid material in general, and thus furnish a chemical and physiological explanation for the appearance of sugar in the body, even in the absence of all sugar or starch in the food. All normal katabolism is attended by the production of sugar. The cleavage of proteids by the digestive ferments liberates a certain quantity of sugar. Though glycogen is readily converted into glucose, Dr. Pavy denies that this change ever takes place during life in the liver-cells, or that they are ever in a more saccharine condition than any other part of the system; that the liver stands in the same relation as other structures, not only as regards the amount, but likewise the nature of the sugar present; that the sugar obtained from the liver after death must be regarded as a post-mortem product, and not as a result of normal physiological processes.

The liver neither forms sugar to be discharged into the circulation nor temporarily stores up the absorbed glucose under the form of glycogen, to be subsequently hydrated and discharged into the circulation, but, on the contrary, does the very reverse. Its office is to arrest the passage of the sugar; to offer a line of defence against its escape from the portal into the hepatic blood. In proportion as this line of defence is insufficient will be the escape of sugar into the general circulation, an

increase in the sugar percentage, and its immediate elimination by the kidneys.

The urine always contains sugar, as Dr. Pavy demonstrated by the employment of the phenylhydrazine test. The amount is in proportion to that existing in the blood, with which the quantity in the urine rises and falls. The latter may be taken as an index of the former.

The theory of glycogenesis offers no clue to the final disposition of sugar in the system. According to Dr. Pavy, all carbohydrates when brought into relation with living protoplasm experience three changes: 1. Transmutation, by which is understood the reduction of glucose through dehydration to glycogen for storage-purposes. 2. Application to the production of proteid material. 3. Transformation into fat. The second process, the formation of complex proteids, through the synthesis of peptones and sugar, takes place very largely in the epithelial cells of the intestinal villi. This synthesis is regarded as one of the most important functions of the protoplasm of these cells. In this way the blood is furnished with characteristic albuminous compounds necessary to the construction of tissues. The third process, the transformation of carbohydrates into fat, an indisputable fact, is also effected by the synthetic power of protoplasm somewhere in the body, and of all places none is more propitiously circumstanced to meet all the requirements of the problem than the intestinal villi.

All carbohydrate material which has escaped combination with peptones or conversion into fat by the villi epithelium becomes transmuted into glycogen by the liver. In the liver-cells and by their agency glycogen is likewise transformed into fat, though the process is not a direct one, but one in which the production of a proteid plays an intermediate part.

Diabetes arises from two causes: 1. An ineffectual abstraction and storage of sugar, due to some impairment in the activity of the liver-cells. The sugar thus escaping into the general circulation is promptly excreted by the kidneys. 2. A rapid cleavage of the proteid constituents of the tissues in consequence of some profound alteration of the general nutritive process, whereby sugar is liberated in unusual quantities. The first form can be completely controlled by dietetic management, the second only so to a partial extent. These conclusions are based on an analysis of some 2642 cases. Whatever may be the outcome of Dr. Pavy's hypothesis, there can be no doubt as to the value of his experimental researches. This work will long be regarded as one of the most valuable contributions to the physiology of the carbohydrates. No one can be said to be abreast of this problem who has not carefully read this work. A. P. B.

A MANUAL OF HYGIENE. By MARY TAYLOR BISSELL, M.D., Professor of Hygiene in the Woman's Medical College of the New York Infirmary for Women and Children. Pp. 338. New York: The Baker & Taylor Co., 1894.

THIS book, which Dr. Bissell in her preface says "is not offered as a substitute for the many elaborate treatises on the subject," is so much better than many of the latter that one cannot help entertaining the hope that some day she may be inspired to offer a treatise which will

rank with the very best. Unlike many writers on hygiene, Dr. Bissell, before attempting a text-book, has evidently given her subject much study, the result of which is a book ably, gracefully, and entertainingly written. It is true that the book is not perfect. What work on hygiene is? It contains mistakes here and there, many of them evidently from oversight; but the defects are as nothing when one considers the admirable qualities of the book as a whole. From the evident care which has been bestowed on the preparation of this, the first edition, one may be certain that in future editions the mistakes will be rectified and all advances in the science duly noted. C. H.

TEXT-BOOK OF HYGIENE. A COMPREHENSIVE TREATISE OF THE PRINCIPLES AND PRACTICE OF PREVENTIVE MEDICINE FROM AN AMERICAN STANDPOINT. By GEORGE H. ROHÉ, M.D. Third edition. Pp. 553. Philadelphia: The F. A. Davis Company, 1894.

THERE was no excuse whatever for the original appearance of this book in 1884, and the same is true of the present edition. It is a pity that so much that is good should be mixed in with so much that is not only distinctly bad, but so bad as to make the work worse than useless as a text-book. The chapters which may be called good are those on Industrial Hygiene, Marine Hygiene, Quarantine, History of Epidemics, and Antiseptics, Disinfectants, and Deodorants. The other chapters are not up to the standard of even respectable mediocrity. The preface states, "In this edition every chapter has been subjected to a careful revision." How thorough this revision has been can be judged of by this gem, which, except for a slight change in the punctuation, is as it appeared in the first edition: "If the hardness is due to carbonates it is dissipated by heat, as in boiling the water; the carbon dioxide is driven off, and the base (calcium or magnesium oxide) is precipitated upon the bottom and sides of the vessel. This is termed the 'removable hardness.'"

Following this in the present edition is the following strikingly original method for the determination of hardness:

"To a definitely measured quantity of water (say 100 c.cm.) in a graduated burette, a quantity of the soap-solution is added and the mixture shaken up; so long as there are dissolved lime and magnesium salts in the water the soap is decomposed and no lather is formed. Soap-solution is now added gradually, and the shaking repeated until there is evidence of saponification by the formation of a more or less permanent lather or froth." We have here not only a unique method of using a burette, but a novel interpretation of the meaning of saponification.

These passages are but fair samples of the many illustrations, in which the book abounds, of the danger of attempting to handle subjects with which one is unfamiliar. Should the book reach an undeserved fourth edition it is to be hoped that it will be carefully revised and very largely rewritten. C. F. C.

PROGRESS
OF
MEDICAL SCIENCE.

THERAPEUTICS.

UNDER THE CHARGE OF

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The Treatment of Tuberculosis by Ichthyol.

Dr. L. Guido Scarpa has used the ammonium preparation during the past year with excellent results. The drug not only has a reducing action upon tissues, rendering them anæmic, contracting the bloodvessels, antiphlogistic and even analgesic, but also as an antiseptic it has a direct influence upon pathogenic bacteria, especially upon the streptococcus and diphtheria bacillus, to a less degree upon the bacillus pyocyaneus, typhus, cholera, and malignant pustule bacilli. It is also a conservator of tissue-waste, and can be borne in large doses by the alimentary tract. From the 150 cases under observation, in which the drug was used in solution (1 to 3) in water, glycerin, rectified alcohol, or oil of peppermint, the last being used to conceal the disagreeable odor, the results were encouraging. Of this mixture from 20 to 200 drops were taken each day well diluted in water, 10 to 15 ounces. The patients soon become accustomed to the disagreeable odor and taste, and no untoward symptoms have been noticed. It seems to be a valuable remedy which may replace guaiacol, without, however, possessing the disadvantages of the latter.—*Therapeutische Wochenschrift*, 1895, No. 17, S. 342.

Is Antitoxin Curative in Diphtheria?

Dr. Joseph E. Winters presents a very scholarly paper which is based upon three months' daily observation in the Willard Parker Hospital, where 154 cases of diphtheria were treated with antitoxin. Taking four cases admitted in one day as a text, he states that in not one single case has there been the least evidence that the formation of the pseudo-membrane was checked, that the exfoliation of the pseudo-membrane was hastened, or that the throat was free from membrane earlier than in cases which have not been treated by antitoxin. In not a single septic case has the antitoxin made the least impression upon the symptoms. The toxæmia has not in one instance

been relieved or lessened. There has been no indication in the character or frequency of the pulse, nor in the general condition of the patient, that a specific for the toxæmia had been administered. During the first three months of 1894 the death-rate at this hospital without antitoxin was 32 per cent.; during the corresponding months of 1895, with antitoxin treatment, the death-rate was 28 per cent., and this, too, when diphtheria was far milder than it was one year previous. The serum used in the early part of the antitoxin treatment was so weak that it was stated that but little could be expected of it. The record showed that the cases treated with the weaker serum did better than those which were treated with the stronger serum, and that those who had the smaller dose of serum did better than those who had a larger dose. In fact, a careful study of the individual cases will show that there is no relation between the antitoxin treatment and the recoveries. As to the untoward or unfavorable effects of the antitoxin treatment, it was found that babies who presented but slight clinical evidence of diphtheria after receiving antitoxin may develop an antitoxin infection, of which the symptoms may gradually subside, leaving them emaciated and extremely anæmic, or there may be a fluctuating temperature ranging from 99° to 106.8° F., and existing for days together. Horse-serum dissolves human blood-corpuscles, and thereby produces new elements of decomposition. The condition of these babies was one of antitoxin septicæmia, brought about by the influence of the antitoxin in the blood. Further evidence of septicæmia is to be found in occasional suppurations showing a temperature-range such as has not been seen since the introduction of aseptic surgery. In some cases of death the necropsy has shown that the patients had recovered from the diphtheria, but had died from pneumonia; this pneumonia is that of septicæmia, and this in turn was induced by antitoxin. Another danger is that of nephritis, which can be fatal, as was shown by Lennox Browne (six out of eight cases treated by antitoxin) and Benda (thirty-three out of thirty-nine deaths from the antitoxin treatment). Further dangers may arise from its action upon the nervous system, and varies according to individual susceptibility; death may speedily ensue. The use of the antitoxin may be immediately dangerous to life through its influence on the kidneys and on the nervous system, and, remotely, through its influence on the blood.—*New York Medical Record*, 1895, vol. xlvii. p. 501.

The Treatment of Diphtheria.

Dr. D. Braden Kyle states that the infected mucous membrane surfaces should be frequently and thoroughly cleansed. Loeffler has been able with his toluol solution to obtain as good results as with the serum treatment. The solution consists of alcohol 60, toluol 36, liquor ferri sesquichloridi 4, which is highly germicidal in that it will destroy pure cultures of the Klebs-Loeffler bacillus and also of the germs closely allied to this disease, especially the streptococcus, when exposed to it for only a few seconds. The infected areas are swabbed with this solution every two to four hours, the membrane readily dissolving. Equally good results have been obtained by substituting creolin for the iron, and menthol can be added to relieve the pain.—*Therapeutic Gazette*, 1895, No. 4, p. 225.

The Treatment of Lupus by Cantharidin.

Dr. O. Liebrich states that a remedy for tuberculosis must be something other than that which destroys tubercle bacilli alone, but must have as well some effect upon the vital forces. After presenting the peculiar action of the drug and showing that medicinal doses, even if continued for two and one-half years (case cited), will not give rise to any pathological changes in the kidneys, he points out its beneficial effects upon general symptoms. Cantharidin can be given internally as a sodium cantharidinate or as the pure drug dissolved in tincture of orange-peel (1 to 5000), or by hypodermatic injection. From the results of his treatment he concludes that the dogma that lupus vulgaris cannot be cured without cicatricial tissue is untrue, and demonstrates that this drug has a curative action.—*Therapeutische Monatshefte*, 1895, Heft 4, S. 167.

Losophan in Dermatology.

Dr. I. Abbott Cantrell has experimented with this drug, which is triiodocresol, and is produced by the action of iodine upon m-oxytoluic acid, in the presence of an alkali. It was used as an ointment in from 2 to 5 per cent. with petrolatum; as dusting-powder with starch, 1 to 15 per cent.; in solution in alcohol and water, 1 to 5 per cent. It was used in 111 cases: eczema, 43; scabies, 23; pediculosis vestimentorum, 5; ringworm, 16; impetigo contagiosa, 8; alopecia areata, 2; dermatitis venenata, 2; furuncle, 2; and seborrhœa, 2 cases. From this experience he concludes: 1. It has proved to be entirely inefficacious in almost every disease of the skin. 2. Tinea sycosis was cured in one instance, but after two months' treatment. 3. It possibly may be beneficial in acne. 4. It is a waste of time for any one to make use of it in treating diseases of the skin.—*Therapeutic Gazette*, 1895, No. 4, p. 221.

Malt Extract and Diastase.

Prof. John M. Francis states that malt extract contains not starch but dextrin, soluble starch, and maltose, small quantities of albumin, gum, and inorganic salts, and, more important than all, the portion of diastase which was not consumed by the starch or destroyed in the process of evaporation. If it is marketed in the liquid form a preservative is added, usually alcohol, sometimes glycerin, which does not serve the purpose so well, and in the cheaper forms, borax, boric acid, and salicylic acid. No matter what precautions are taken they gradually but surely lose their diastasic activity. These extracts have two functions; to afford a supply of amylaceous food for a weak and diseased stomach, and in a predigested condition, ready to be assimilated without the effort of physiological preparation—in this *rôle* its field of usefulness is very broad. Second, we may employ malt extract to afford an extra supply of diastase for the digestion of food which has already been ingested, and which the stomach seems unable to dispose of in the proper manner. Nearly two-thirds of our food consists of starches, and we probably overlook the greater source of digestive troubles in our efforts to assure the disintegration of the fats and proteids. If, then, there is frequent need of an extra supply of diastase, it naturally follows that the best malt

extract is the one containing the most available diastase. To meet this indication it would be well to have a diastase pure and simple—one which can be dispensed in pills, tablets, or powders; which occupies a small space; which will retain its activity in any climate; which is concentrated enough that in moderate dose it will materially aid in the digestion of the bread, cakes, and pastry which are usually presented in such a gummy, glutinous, or compacted mass, or so permeated by grease that the action of the diastasic fluid is greatly retarded. That this is possible has been shown by the preparation of diastase, in an experimental way, of which one part will dissolve 50,000 parts of starch. Considering the large number of sources of diastase there is likely to be a demand for something more powerful than the ordinary malt extract, namely, a pure diastase meeting the requirements noted above. —*Bulletin of Pharmacy*, 1895, No. 5, p. 200.

Guaiacol.

M. E. Blaise administers this drug in daily doses of from seven to twenty grains with benefit in pulmonary tuberculosis. Those patients who acquire an unconquerable dislike for cod-liver oil may be able to take this remedy if guaiacol is added to it, which also greatly aids its absorption. If dissolved in a sterilized bland oil, it may be given hypodermatically in from 20 to 50 per cent. solutions. In general it is well borne by the stomach; this tolerance being explained by its anæsthetic properties, which have been utilized in laryngology. Its valuable antipyretic effects when used externally are well known. It is eliminated by the kidneys, commencing very shortly after its administration, reaching its maximum between the second and fourth hour, and after twenty-four hours the urine contains no trace of the drug. It is excreted as potassium guaiacol-sulphonate, about 55 per cent. of the total amount ingested. Not only is it an antipyretic when locally applied, but it is also analgesic in acute or chronic rheumatism, intercostal pain, neuralgias, and it has been used in pleurisy with tincture of iodine (3 to 25); in painful orchitis as an ointment with vaseline (3 or 5 to 30) it has given good results. The best application as an antithermic is with equal parts of anhydrous glycerin. The synthetic guaiacol is preferred to that of fractional distillation.—*Les Nouveau Remèdes*, 1895, No. 9, p. 201.

The Hygiene of Sanatoria for Patients Suffering from Phthisis.

Dr. Netter formulates the following rules which are in part applicable to those dwelling at home: The residence should be so situated that it is not exposed to the prevailing winds. About the house should be a zone of isolation devoted to a park and to cultivated land, necessary as well for the patient, who should be in the open air, which is the basis of the treatment of tuberculosis. Expectoration should be only into cups containing a certain quantity of water. These cups should be disinfected every day. There should be an oven under the charge of a skilled and conscientious attendant. The linen should be delivered to the laundry only after sterilization in the oven. The room should be disinfected before receiving a new occupant, and

to facilitate this the floor and walls should be so constructed that they can be washed and brushed with antiseptic solutions; the floors varnished, or, better, covered with linoleum; the walls painted in oil. The dejecta should be disinfected.—*Journal des Praticiens*, 1895, No. 19, p. 292.

The Treatment of Tuberculosis.

Dr. Fedor Schmey notes the rarity, on necropsy, of an uncomplicated tubercle bacillus infection, and points out the inefficacy of tuberculin in these cases of mixed infection. He makes use of gelatin capsules, each containing five grains of balsam of Peru and three grains of guaiacol, three capsules three times daily during the meal, and this number is to be increased until twenty capsules *per diem* are taken. It is necessary to take as many as a thousand capsules. In addition to this it is well to inhale by means of a spray the following: Balsam of Peru, 10; wine spirit, 30; distilled water, 200, each day. The alcohol is not only necessary, but as well useful in diminishing cough. For bone, joint, and skin tuberculosis subcutaneous injections of salts of cinnamic acid, particularly the sodium, have given good results, and apparently have not given rise to any symptoms of renal irritation. These observations made from a surgical standpoint tend to show the value of balsam of Peru, for the latter contains cinnamic acid. It is claimed that not only is the balsam of Peru useful against a mixed infection, but as well has a direct specific action upon the tubercle bacilli.—*Therapeutische Monatshefte*, 1895, Heft 5, S. 244.

The Treatment of Typhoid Fever.

Dr. Wm. Ewart considers that the treatment is concerned with three great objects: (1) the patient, *i. e.*, the preservation of vitality and nutrition. (2) The disease itself, *i. e.*, the removal of the cause. (3) The effects of the disease, *i. e.*, the relief of the symptoms. Under the first heading, while paying due regard to the mechanical danger of too much movement of the diseased bowel, it is essential not to forget that it is also capable of being overloaded and strained by excessive bulk of fluid, especially if this should lead to flatulency. Above all, a well-supported nervous system and well-nourished tissues are the best defences against necrosis and against the danger of perforation. The importance of substantial support and of preservation of the gastric and upper intestinal functions renders the early administration of alcohol undesirable. It is worth considering whether we may not at suitable periods combine a fairly liberal portion of carbohydrate foods, which leave no appreciable residue, with milk. During the first ten to fourteen days there is little reason for abstaining from the lighter foods. Some of the principles contained in them may, after this time, be continued in fluid form, as fruit juices, vegetable broths. In the healing of ulcerations, especially along the alimentary tract, assistance is derived from a fresh vegetable diet. In the early stages of convalescence, articles of diet can be so selected that they will afford considerable nutrition without loading the bowel with much residue, as thin arrowroot, chocolate, honey, yolk of egg, maltine. Among the indications for treatment attention to the liver is important. In enteric fever it is practically immobilized for prolonged periods and deprived

of a great deal of the pressure and movement connected with abdominal respiration, which is usually in abeyance. The physiological stimulation of the duodenal papillæ by the passage of food, owing to the exclusively fluid nature of the supplies, is reduced to a minimum, and reflex contraction of the gall-bladder ceases to be favored, and the bile, an antiseptic which surely reaches undecomposed the seat of the ulceration, is diminished. Anæmia, due to restricted alimentation, the original infection, and prolonged absorption of septic material from the bowel, is a prominent symptom. The local indications must be met by remedies introduced *per vias naturales*, and in order to insure the efficacy of any antiseptic introduced by the mouth, its administration must be continuous, since it cannot be given in concentrated doses. And since the remedy must expend its chief action on the stomach and on the whole intestine above the seat of the disease, and be partly absorbed by them, it is of the utmost importance that it should be incapable of doing any harm. The symptomatic indications cover the clearance of the bowel of offending matter and the restoration of the mucous membrane to as healthy condition as is possible, so that food may be absorbed. The first end may be reached by the administration of castor oil or calomel in a first purgative dose, and followed up with quarter or third of a grain doses repeated three or four times daily, either combined with small doses of opium or supplemented with more active aperients. The second indication is met by a strict fever-diet during the first few days of anorexia. As soon as the appetite and tongue improve, the patient may be prepared for his period of starvation by varied and nutritive, though light, supplies which leave but little insoluble residue. Of the various drug treatments, the use of mercury and iron is recommended. The advantage of the former as an aperient lies in its antiseptic properties. Twenty-minim doses of the tincture of ferric chloride and thirty minims of the solution of mercuric chloride are administered every four hours through the course of the disease. It is claimed that by this method the diarrhœa is controlled, the complexion and faculties are brighter, there is improvement in every direction, and speedy convalescence. There is a general tonic effect on the nervous system, beneficial effect on the blood, liver, and mucous membranes, and the above-mentioned control of the diarrhœa may be due to either local antisepsis or the astringent properties of the iron.—*Medical Press and Circular*, 1895, No. 2923, p. 505.

The Glycero-phosphates.

Dr. Albert Robin has completed a six years' study of these remedies, which have an elective action upon the nervous system, reawakening the failing nervous energy and stimulating it to activity. In comparing the effects produced by the injections of testicular fluids in which phosphorus in organic combination is one of the essential principles, we have simply an uncertain, variable, markedly changeable preparation replaced by a well-defined product of which the dose can be easily regulated. Subcutaneous injections of sodium glycero-phosphate increased the quantity of urine five times in eight; in general, the specific gravity lowers as the quantity increases; the solids increased five times in seven; and this increase indicates an acceleration of total nutrition. Both organic and inorganic changes are increased, the latter in a manner perhaps more constant. The nitrogenous

metabolism increases; there is a better utilization of the disintegrated products, and a tendency toward a diminution of uric acid. In the majority of cases the total sulphuric acid increases as well as the coefficient of sulphur oxidation, so that the metabolism of organs rich in sulphur, as the liver, for example, and the evolution of sulphurous products become more complete. Sodium chloride increased six times in seven, corresponding to the clinical fact, an increase of appetite. These drugs do not tend toward the denutrition of organs rich in phosphorus, but, on the contrary, they act upon them as a means of preventing waste. And, further, they probably favor the assimilation of a small quantity of the alimentary phosphates. In a study of their effects upon lime-salts it was shown that there was an acceleration of the nutrition of bones, without, however, influencing in a corresponding manner the phosphorus-metabolism in the same tissues. They do not have a marked effect upon intestinal fermentations. Taken as a whole, these observations show the great value of the glycero-phosphates in checking the denutrition of the nervous system and in aiding its restoration to normal conditions. The indications for the use of these drugs do not fall under the title of any one disease, nor is any one disease a contraindication. They are useful when (1) there is a failure in nitrogenous metabolism, as, for instance, in chlorosis, chronic gout, diabetes, obesity, chronic pulmonary phthisis, chronic Bright's disease, phosphatic albuminuria, dyspepsias with gastric insufficiency and diminished hydrochloric acid, and debilitated old persons. (2) Cases of hepatic insufficiency, brick-dust sediment in the urine, urates tinged with uroerythrin. (3) Malnutrition of the nervous system, whether due to an exaggerated denutrition or insufficient assimilation. As examples: convalescence from acute diseases, especially from epidemic influenza, the various phosphaturias, a large number of neurasthenias when they follow phosphaturia, phosphoruria, dyspepsias from gastric insufficiency, intellectual fatigue with nervous *surmenage*, muscular atrophy, paralyses in general, pains of ataxia, tic douloureux of the face, sciatica, and chronic lumbago. No effect has been noted in mental diseases nor in progressive general paralysis. One case of Addison's disease improved. (4) In bone-diseases, as rhachitis, osteomalacia, fractures, and diseases of growth, the lime and magnesium glycerophosphates should be employed. In short, the glycero-phosphates should be considered as remedies for nervous depression. For subcutaneous injection the salts of lime, sodium, and magnesium alone have been used in solution in the percentage of 5 for lime and 20 for sodium; the amount injected representing from one to eight grains of the lime salt and from three to twenty grains of the sodium salt. Strict antiseptic precautions must be observed, as these solutions are excellent culture-media for many microbes. When given by the mouth the salts of lime, sodium, potassium, and magnesium can be given in daily dosage of from five to fifteen grains, preferably during the meal. The iron salt is administered in from one-and-a-half to five grains per day.—*Bulletin Général de Thérapeutique*, 1895, 18e liv., p. 385; 20e liv., p. 433.

Lavage of the Stomach.

Dr. Faucher insists that the tube which bears his name should be of the flexibility and size which he designated in his first communication made in

1879. With this one need not fear the nervous accidents, fatigue, possibility of hemorrhage, and various other accidents, even to complete failure, which have been cited as contra-indications to the use of this method. As to the indication for the operation, it depends entirely upon the contractility of the stomach. So long as there is gastric retention—that is, the food remains in the stomach for a period longer than the interval between meals—lavage has given good results, irrespective of the form of disease which gave rise to this retention.—*Revue de Thérapeutique*, 1895, No. 11, p. 331.

The Effect of Hot Baths upon Chronic Circulatory Disturbances.

Dr. Alfred Högerstedt has made use of the full baths of 30° R. [99.50° F.], and concludes that (1) we may expect from further investigation of the relation between blood-pressure and pulse, during the so-called palpitation, that the clinical diagnosis of the nature of these attacks may be substantially advanced. (2) So far as we may conclude from the observations cited, the irregular and suddenly arising pulse-acceleration and increasing blood-pressure, beginning at the same time and outlasting it, seems to belong with the earliest objective symptoms of coronary arterial sclerosis. While the increasing frequency of the pulse is only at the beginning of the attack, the higher blood-pressure was regularly so long apparent as the existence of the palpitations. So also the duration of the increased blood-pressure was according to the duration of the attack. In other words, the idea "subjective palpitation" is no longer permissible. (3) Since attacks of this kind continually make repeated claims upon the reserve strength of the left heart, it should be the purpose of the treatment of such patients to save the strength of the heart from the beginning. (4) Though the unfavorable reacting antagonism to the work of the heart which is found in the venous flow of the greater circulation is not brought about by the warm baths, and in spite of the impression that the warm bath in itself did not materially aid in relieving the palpitation, it is still impossible to answer fully the question whether the general action of the baths, in these cases, may be called a beneficial one. No more can be at present stated than that it may be taken for granted that the action of the warm bath on the vaso-tension may be relative to the direct antagonism of this by the excitation of the vasomotor centres which accompanies palpitation.—*St. Petersburger medicinische Wochenschrift*, 1895, No. 16, S. 141.

The Treatment of Syphilis.

Dr. Edmund Saalfeld cites two cases which go to show that mercury is not, in all cases, a specific. For patients who are, as frequently happens to syphilitics, in lowered general nutrition, somatose, a meat-preparation, is used with excellent results. Milk fills an important place, particularly in mercurial stomatitis when solid food is impossible; but the tendency of milk to cause diarrhœa, especially in patients using mercury, is increased, and this danger must be guarded against. Here, also, somatose is useful. It does not possess the unpleasant taste of more artificial meats, nor does it irritate the mucous membrane of the alimentary canal. It can be administered in tea-

spoonful doses three to four times daily, in milk or broth or barley-soup. It can be given with chocolate or cocoa, or as a somatose biscuit. It not only improves the nutrition, but as well increases the appetite and enables the patient to respond to specific treatment.—*Therapeutische Monatshefte*, 1895, Heft 5, S. 247.

MEDICINE.

UNDER THE CHARGE OF

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PEPTONURIA.

SENATOR gives a timely contribution to the vexed question of peptonuria (*Deutsche medicinische Wochenschrift*, 1895, No. 14, p. 217). The method of Salkowski was used, being carried out as follows: The urine, free from albumin, is treated with hydrochloric acid and precipitated with phosphormolybdic acid, the precipitate warmed and washed with water. It is then dissolved with dilute sodium hydrate solution and warmed until the solution acquires a yellowish color. After cooling the biuret-test is used. The procedure can be carried out in about five minutes, and, according to Salkowski, is almost as sensitive as Hofmeister's complicated method. Senator finds that peptonuria occurs frequently or regularly in certain diseases, as croupous pneumonia just before or after the crisis, in purulent meningitis, or peritonitis and empyema. It is much less frequent in articular rheumatism and has not been found in leukæmia. The diseases in which peptonuria occurs are usually not difficult to recognize, so that its demonstration is not very important. This statement, however, is not true of meningitis, and according to Senator, when peptonuria is present along with the other symptoms, that disease may be diagnosticated. An interesting case in this respect was that of a young man with a long-standing otitis media, who was taken sick with fever and pain in the head and neck. Repeated examinations showed no peptone in the urine and operation revealed a cholesteatoma. In confirmation of the work of von Noorden and Stadelmann it was found that the peptone in these cases was not Kühne's peptone, but albumose. This seemed in some cases to be protalbumose, but the reactions were not absolutely certain.

LACTIC ACID AND CARCINOMA OF THE STOMACH.

G. KLEMPERER (*Deutsche med. Wochenschrift*, 1895, No. 14, p. 218) has tested for lactic acid according to the method of Boas and reaches the fol-

lowing conclusions: The production of lactic acid in the stomach indicates long-continued stagnation of the contents. This occurs most frequently in carcinoma. There can be cancer of the stomach without lactic acid, just as there can be non-cancerous disease of the stomach with lactic acid. Nevertheless, Boas's test is of great practical value, though not specific. (In fifteen cases of cancer of the stomach lactic acid was absent in three.)

Removal of a Piece of Pyloric Mucous Membrane by the Stomach-tube.

Ebstein (*Berliner klin. Wochenschrift*, 1895, No. 4) reports a case in which this accident happened, the fragment being found in the fenestrum of the tube. The case was one of chronic peritonitis with strictures and dilatations of the duodenum. Death occurred from septic peritonitis four days after a laparotomy. Neither loss of tissue nor cicatrix could be found in the stomach. Ebstein thinks this accident much more frequent than is usually believed. Position and size of the stomach, and, as in the case reported, adhesion with neighboring organs, favor the occurrence. The author advises distention before passing the sound in order to be able to form an idea of the extent and configuration of the stomach. The sound must be sufficiently thin; must not be removed too rapidly, but slowly, and while water is allowed to run in. The occurrence of vomiting while the tube is in the stomach necessitates special caution.

Neuroses and Anæmia.

Reinert (*Münchener med. Wochenschrift*, 1895, No. 14) has determined the hæmoglobin in a number of cases of neurotic disorder, including hysteria, neurasthenia, chorea, epilepsy, and migraine. Out of 48 cases of hysteria, 30 per cent. had 80 per cent. or more of hæmoglobin, which can be looked on as physiological. Forty-seven per cent. of the cases had from 70 to 80 per cent., 18 per cent. from 60 to 70 per cent., 1 case from 50 to 60 per cent., and 1 case 30 to 40 per cent. of hæmoglobin. Of 36 cases of neurasthenia, 13 had 85 per cent. or more, 21 had 70 to 80 per cent., and 2 had 60 to 70 per cent. The average in 6 cases of chorea was 72.9 per cent.; in 3 cases of epilepsy 74.6 per cent. In 70 per cent. of all the cases there was a diminution, usually slight, of the hæmoglobin. While in these cases the anæmia might be looked on as the anatomical basis of the disease, it must be remembered that the blood-alteration in many cases is secondary. However, impoverished blood reacts on the nervous system, so that the examination of the blood is important in the prophylaxis and treatment of neurotic disorders.

Diphtheria Antitoxin at the Congress for Internal Medicine.

In the recent Congress in Munich, Baginsky, Heubner, Widerhofer, and Ranke all spoke in favor of the serum treatment of diphtheria. The following conclusions, stated by Baginsky, fairly represent the sentiments of the others. "The serum is a thoroughly effective remedy, the best so far used in diptheria. It is most effective in proportion as it is used early. A combination of this with measures formerly used, such as mild antiseptic

treatment (gargles) of the local lesion is rational and useful. The use of antitoxin is not attended with serious accidents or diseases. The exanthemata, joint-affections, etc., are similar to those observed in diphtheria treated by older methods, and, even if more frequent than formerly, are not at all dangerous. The uncertainty as to the mode of action of the remedy should not affect its application, after the value of the method has been demonstrated empirically beyond doubt." KOHTS was not enthusiastic in his expressions, although he admitted that the local disease was often unmistakably checked by the antitoxin treatment. SEITZ spoke especially of the complications in cases treated with serum, based on one hundred and forty cases under his own observation. Renal symptoms, cardiac weakness, paralysis, and enlargement of the spleen are not more frequent under antitoxin treatment. The occurrence of skin-eruptions was more frequent, as were also pain and swelling in the joints. These did not interfere with perfect recovery. Diseases complicated with diphtheria, such as pertussis, pneumonia, severe heart-disease, tuberculosis, and osteomyelitis were made no worse by the specific treatment, and the effect of the latter was unmistakable. The use of the remedy as a prophylactic was not very warmly encouraged, the duration of immunity especially being uncertain, and the effect of the antitoxin in healthy bodies not sufficiently known.

PUNCTURE OF THE SPINAL CANAL.

This operation, originated by Quincke in 1891, and since then practised by many other German clinicians, has been performed more than one hundred times in eighty-six cases by FÜRBRINGER. He punctures in the second, third, or fourth interlaminar lumbar space, with the patient sitting and bending over instead of lying, as generally practised. The subarachnoid fluid is reached at a depth of from two to seven centimetres. In infants forced puncture and badly aimed needle may cause the latter to pierce the soft cartilage of the vertebræ and enter the aorta, an accident narrowly escaped by the author. Pain referred to the head, neck, or back is usually due more to aspiration than the puncture itself. For that reason it is better to allow the fluid to run out spontaneously than to aspirate. The amount of fluid varies from a few drops to 100 c.cm., and the force of the stream varies with the amount. Occasionally the flow is checked by the aspiration of a strand of the cauda equina. In one case slight injury of the cauda was followed by a sciatica-like pain; in another tremor of the leg. The greatest pressure and largest amount of fluid were observed in cases of basal meningitis or brain-tumor, but Fürbringer finds these features so contradictory as to be without practical value. In thirty-seven cases of tubercular meningitis, some of which could not be distinguished from typhoid fever, influenza, endocarditis, and sepsis, tubercle bacilli were found twenty-seven times, and in all of these cases the diagnosis was confirmed post mortem. In meningitis improvement did not follow puncture, but in a case of chronic hydrocephalus, with tubercles in the cerebellum and with frequent epileptiform attacks, repeated puncture gave relief. In two case of uræmia withdrawal of 90 c.cm. of fluid in one case and 50 c.cm. in the other did not affect the coma, and death occurred in both cases shortly afterward. In a case of

hemorrhage in the lateral ventricle puncture of the spinal canal (post mortem) showed almost pure blood. In a case of hemorrhage into the fourth ventricle puncture during life was also positive. In cases of pneumococcus-meningitis puncture was of great clinical value, and the method promises to be of value in distinguishing bacterial diseases of the central nervous system. In the examination of tubercular cases the small fibrin and leucocyte bits found even in the clearest fluid in these cases revealed bacilli when the clear fluid did not. The centrifugal method was used as a control, but the diagnosis was always made without it. On the whole, the therapeutic value of the procedure deserves further study.—*Berliner klin. Wochenschrift*, 1895, No. 13, p. 273.

Disease of the Muscle of the Auricles.

Radasewsky (*Zeitschrift für klin. Med.*, Bd. 27, S. 381) thinks that the cardiac arhythmia of so-called chronic myocarditis is due to degeneration of the walls of the auricles and not of the ventricles. Previous workers have limited their observations almost entirely to the walls of the ventricles, and, although in many cases the changes in question are to be found there, it has not escaped notice that in some cases of severe fibroid degeneration of the ventricle the heart remained regular to the end. Radasewsky examined six hearts, after the method of Krehl, but including the auricles, and found that in the cases (two) of myocarditis with regular heart-rhythm the auricular wall was intact, whereas in the other cases it was more or less seriously affected. The author also calls attention to the diffuse fibroid degeneration of the heart-muscle, a condition of great importance to the clinician, but seldom recognized post mortem. This latter is due to the fact that only a careful microscopic examination can reveal the change.

Typhoid Fever.

Berg has analyzed 1626 cases of typhoid fever treated in the Leipzig clinic from 1880 to 1893. The treatment was purely expectant. Twenty-two cases were under five years of age; forty-six between five and ten. Two-thirds of all the cases were between fifteen and thirty years of age. The average mortality was 12.7 per cent., varying in different years from 7 per cent. (1884) to 18 per cent. (1883). The mortality increased from 8 to 9 per cent. in the second decade, to 60 per cent. in the eighth, but below the tenth year was as high as in the third decade (13 per cent.). In 27 per cent. of all cases fever lasted more than four weeks. The duration was not shorter in children than in adults. Relapses were observed in 3.3 per cent. of cases. Four patients had repeated relapses (three in one case). Recidive occurred in 12 per cent. of all cases. It was more frequent in women than in men, in children than in adults. Seventy-five per cent. of recidives followed mild or moderately mild cases. In most cases the recidive came on from two to twelve days after defervescence, and lasted six to twenty days. One case had a recidive on the seventy-seventh day. The longest recidive lasted six weeks. Less than 3 per cent. of recidives were fatal. The eruption was positively present in 80 per cent. of cases; doubtful in 5 per cent.; absent in 14 per cent. The spleen was palpable in 69 per cent. There was diar-

rhœa during the whole course in 25 per cent.; normal stools always in 4 per cent.; constipation in 16 per cent.; in the others alternating diarrhœa, constipation, and normal stools. Hemorrhage was observed in 5½ per cent. of cases. It began usually in the second week, but was seen as late as the fifty-fifth day. Hemorrhage was more frequent with the advance of age (3.8 per cent. up to fifteen years; 14.3 above the sixtieth year). The mortality of cases with hemorrhage was 38.2 per cent. Pregnancy in typhoid was almost always interrupted by abortion or premature birth. The course of such cases was usually most severe. The life of the fœtus was not affected. Psychoses occurred in 1 per cent. of cases, appearing usually during the fever, twice during recidive. Cataleptic phenomena were frequent. Pneumonia, usually hypostatic, occurred in 8.9 per cent. of cases, more frequently in the right lung. Bronchitis was present in two-thirds of all cases, usually short and mild. Pleurisy was observed thirteen times, being dry in six, serous in five, suppurative in two cases. Perforation of the intestine occurred in 2.2 per cent. It occurred most frequently between the twenty-first and thirtieth days. Albuminuria was noted in only 11.3 per cent. of all cases. Nephritis occurred in 2.8 per cent., being much more frequent in men than in women. The process was hemorrhagic, and showed a mortality of 44.4 per cent. Cystitis was rare and of brief duration. Herpes was noted in 0.7 per cent. of cases, in part of them during convalescence. Angina occurred in 2.1 per cent.; parotitis in 0.5 per cent.; epistaxis in 3.1 per cent. of all cases. Death was due to severity of infection in 37 per cent.; to perforation in 16.5 per cent.; hemorrhage 8 per cent. For other details, especially regarding the rarer complications, the original may be consulted (*Deutsches Archiv für klin. Med.*, Bd. 54, S. 161).

Heart-disease in Masturbators.

Bachus (*Deutsches Archiv für klin. Med.*, Bd. 54, S. 201) calls attention to an affection of the heart which he has frequently encountered in masturbators. This is characterized by pain in the cardiac region, anxiety, and frequent annoying palpitation. The heart's action is disturbed in various ways, is frequent rather than slow, usually forcible, and often irregular and unequal. The sounds may be pure, or the first sound at the apex impure, or the second aortic or pulmonary accentuated. The pulse varies with the condition of the heart. Tension and size are usually not materially altered. The cause of the alteration is not easy to determine. That it is due to the increase of work on the part of the heart seems at first sight reasonable, since it has been claimed that blood-pressure is increased during coitus, yet, on the other hand, periodic increase in the work of the heart does not usually lead to hypertrophy. The diagnosis of the condition is based partly on the anamnesis, partly on exclusion of other causes. The treatment includes cessation of onanistic habits, and other unfavorable practises (tobacco, alcohol), as well as symptomatic treatment of the condition.

Pulse-rhythm in Health and Disease.

From observations with the sphygmochronograph of Jaquet, Hüsler (*Deutsches Archiv für klin. Med.*, Bd. 54, S. 229) concludes that the regularity

of the pulse is only relative. Even in health the successive beats of the heart show rather marked irregularity, the causes of which cannot as yet be explained. They make it impossible, however, to define the limit of the physiological rhythm. On the other hand, aside from these variations, the heart shows a marked tendency to preserve its rhythmic action, even in the face of severe general disease or of lesions of the valves. For the production of arhythmia causes as yet unknown must act on the cardiac mechanism.

Iron in the Tissues in Anæmia.

Stühlen (*Deutsches Archiv für klin. Med.*, Bd. 54, S. 248) has investigated this subject recently in Quincke's clinic, using material from six cases having the clinical characteristics of pernicious anæmia and eight cases of severe secondary or mixed anæmia. The usual tests for iron were applied to the liver, spleen, kidneys, bone-marrow, and pancreas. These results are summarized as follows: 1. In most cases of severe anæmia, especially in pronounced pernicious anæmia, iron is deposited in the liver and spleen, and frequently also in the kidneys. 2. In some cases iron granules are deposited in the bone-marrow; in others not. 3. In severe anæmias due to repeated hemorrhages or exhausting discharges the organs mentioned give little or no iron-reaction. 4. In their extremes the cases of different kinds can be distinguished anatomically by the presence or absence of iron. 5. Less characteristic features are found in cases of uncertain origin, in which the clinical picture may resemble pernicious anæmia.

The Pathology of Leukæmia.

Under the somewhat misleading title, "Changes in the Organs in Leukæmia," Hindenburg (*Deutsches Archiv für klin. Med.*, Bd. 54, S. 209) announces a theory of the pathology of leukæmia, based partly on the examination of three cases before and after death, partly on conceptions of the origin of leucocytes not yet positively demonstrated. Hindenburg holds that in leukæmia the mitotic increase of a certain kind of leucocytes goes on in a pathological manner as the result of a cause ("noxa") as yet unknown. Usually the myelocytes are involved, sometimes other varieties of leucocytes. The cause of this predilection is quite unknown. Indirect division of the leucocytes affected takes place in the lymphoid organs, especially in the capillaries of the liver and in lymphatic new-growths, and in many cases in the greater circulation. The germinal centres take part in the increase only in lymphatic leukæmia. Different localizations of the leukæmic process seems to depend on the fact that various kinds of leucocytes show a preference for certain parts of the lymphatic apparatus. The newly formed cells enter the blood partly by way of the lymph-channel, partly directly, as in the spleen and bone-marrow. Entering the circulation and increasing there to some extent, the leukæmic blood is the result. The fact that besides the forms found in the organs in increased numbers other kinds of leucocytes occur in increased numbers in leukæmia, the author explains by a transformation of the former before undergoing dissolution. The question whether leukæmia is a disease of the blood or of the blood-forming organs the author

thinks an idle one, since the fluid tissue called blood and the hematopoietic organs cannot be sharply separated. Finally, the author states that the idea that the leukæmic condition of the blood is due to decreased leucolysis is contradicted by his finding in the organs numbers of bodies which he thinks are degeneration-forms of leucocytes.

Excretion of Uric Acid and Xanthin-bases in the Feces.

A valuable contribution to the study of these important substances is made by Weintraud (*Centralblatt für inner. Med.*, 1895, No. 18). His attention was called to the matter by examining the feces of a case of leukæmia for xanthin-bases and finding these in very large amount, being present in fact to about ten times the quantity excreted normally by the urine. Smaller quantities were constantly found in the feces of healthy persons, and of those sick with various diseases, so that Weintraud claims the xanthin-bases are normal constituents of feces. That these do not come already formed from food, or from nucleins in the food, the author demonstrated by feeding large quantities of food rich in nuclein (thymus) and finding that latter absorbed. The important discovery was made that the excretion of uric acid was enormously increased. It was also found that even after absolute milk-diet (in which xanthin-bases have not yet been found) these were nevertheless present in the feces. Xanthin-bases and uric acid were also found in the meconium of an infant with *atresia ani*. It would therefore appear that xanthin-bases (hypoxanthin being the chief form) are excreted either from the wall of the intestine or the glands which pour their secretions into the intestine. Incidentally the observations demonstrate the absorbability of nucleins in the intestine, the possibility of which has been denied by some.

Cirrhosis of the Liver apparently Checked by Tapping.

Lauenstein reported two cases of the above kind in the Aerztl. Verein in Hamburg (*Deutsches med. Wochenschrift*, 1895, No. 19. Vereins-Beilage, No. 13, p. 82). One case had a clear history of abuse of alcohol; in the other this was probable. In both cases the liver was enlarged. In the first case, after six tappings, the fluid did not reaccumulate during the two and a half years which had elapsed at the time the report was made. The patient had continued to use wine and beer, and had passed through an attack of delirium tremens. The liver became smaller. [The spleen was not enlarged at any time.] In the second case tapping was performed three times, after which the patient remained apparently well for several years. The liver became smaller. The spleen was large in the beginning and remained so.

The Cause of Murmurs in the Heart and Vessels.

It is well known that current explanations of the cause of cardiac and vascular murmurs in works on physical diagnosis ascribe these to eddies in the blood-current, although Kiwisch and T. Weber showed long ago that they must be due to vibrations in the walls of the vessels (or in the valves). This explanation is also given by Fick in his recent "Lehrbuch der medicinischen Physik," and there have always been a few clinicians who have held to this

theory, though perhaps unable to give any reason for it. Recently GEIGEL (*Virchow's Archiv*, Bd. 140, Heft 2, S. 385) has investigated the matter according to well-known facts in physics. Assuming with Funke that the first sound of the heart corresponds to sound-vibrations at the rate of 200 per second, a murmur of the same pitch would require for its production, if due to eddies, a tube (the heart) one metre and fifty centimetres long. This shows the fallacy of the eddy theory, and leaves the theory of lateral vibrations in the walls or valves, due to the friction of the blood, the only rational one.

THE GENESIS OF EPILEPTIC ATTACKS.

From an extensive experimental study BECHTEREW concludes (*Neurologisches Centralblatt*, 1895, No. 9) that in adult animals irritation of the cortical centres can lead to epileptic attacks. If the basal ganglia take part in the attacks, they do so principally in the tonic spasms. Such things as mechanical irritation in the region of the pons, concussion, and intoxication can cause epileptic attacks of basal origin, but even in such cases the cortex takes part and gives the epileptic character to the convulsions.

MYOSITIS OSSIFICANS AND DISEASE OF THE SPINAL CORD.

EICHHORST (*Virchow's Archiv*, Bd. 139) describes two cases of this rare disease which add probability to the view that it is of spinal and trophoneurotic origin. In one case there was a congenital meningocele in the lower part of the lumbar cord, with abnormal development of hair in the vicinity. There was a perforating ulcer of the left great toe. In the second case there were marked tabes, diabetes insipidus, and finally perforating ulcer of the left foot, from which sepsis, eventually fatal, arose.

THE TREATMENT OF TYPHOID FEVER BY STERILE CULTURES OF BACILLUS PYOCYANEUS.

RUMPF has given a later report on this subject (*Bericht über die Verhandlungen des* 13 *Congress für innere Medicin. Centralblatt für innere Med.*, 1895, No. 21, p. 30). Streptococcus cultures had no effect whatever, whereas sterile cultures of blue-pus bacilli had an effect similar to that of the typhoid bacilli. Out of sixty-five cases 13 to 20 per cent. were not affected. In the others the injection caused a primary rise and a fall of temperature on the second day. In this way the stage of continued fever was cut short, became remittent, and apyrexia followed. The author ascribes this not to a specific action of the blue-pus bacilli, but rather to an irritation by which the body is excited to protective action. The experiments have at present a purely scientific value, as the dosage is uncertain and the activity of the cultures variable.

ABSORPTION BY THE RECTUM.

POSNER (*Ber. über die Verh. des* 13 *Congress für innere Med.*) has made some observations showing the rapidity of absorption of certain substances by the rectum. Certain solutions, like indigo-carmine, methylene-blue, etc., injected

into the rectum appear within fifteen minutes in the bile and urine. Other substances, such as naphthol-green B, were not absorbed at all. The experiments confirm early observations as to the importance of the rectum in absorbing remedies or poisons, and led von Noorden to recommend anew the use of quinine suppositories in whooping-cough.

SURGERY.

UNDER THE CHARGE OF

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THE ASEPTIC TREATMENT OF SUPPURATION.

ZEIDLER (*Cent. für Chir.*, April 6, 1895) commends asepsis in the treatment of suppurating wounds. The method employed is the following: The field of operation is carefully prepared. After the ordinary operative technique the cavity is wiped out with sterilized gauze. As a rule, irrigation is not necessary; if it seems necessary, a sterile 0.6 per cent. salt-solution should be used. The wound is then packed fully with sterilized gauze, but not tightly. The further dressing is of sterilized absorbent material.

At the next dressing the skin about the wound is washed with ether or benzine, and the granulating wound dressed with dry sterilized gauze without irrigation. In most cases a dry dressing is sufficient; in some, however, a moist dressing does better; the moistening should be done with salt-solution. The author has not seen decomposition in the wound-secretion in a dressing that remained on for eight days. Free drainage with plenty of sterile absorbent dressing is all that is requisite. The course of the healing is very good. The amount of secretion is small. The dressing is renewed every eighth day.

THE TREATMENT OF STAB-WOUNDS OF THE THORAX.

HUGET and PÉRAIRE (*Rev. de Chir.*, January, 1895) consider that these wounds should be dressed when possible before the patient is moved any distance, since jarring favors hæmoptysis and endangers life. Hypodermatic injection should be used but seldom, and only when the depression is great, as the syncope favors hæmostasis. Caffeine and artificial serum hypodermically injected are to be preferred. Ordinary measures, such as the external application of cold and iced drinks, injections of ergotine, compressive

dressings, antisepsis, and the ligation of bleeding vessels, are in many cases insufficient, if the patient is not immediately placed at rest. This method, of course, does not preclude antiseptic methods, but all manipulations must be made with the utmost gentleness. In case of hæmothorax expectant treatment is the best, and in this case "armed expectation" is most appropriate. Thoracentesis should not be determined upon without great deliberation, and not until drainage is insufficient and symptoms of dyspnœa are marked. Unnecessary toilet of the patient should be avoided.

The Treatment of Bone- and Joint-tuberculosis.

Neuber (*Langenbeck's Arch.*, Band xlix. Heft 1), from a series of cases, concludes that formal resection should be superseded by removal of the diseased tissue and the use of a 10 per cent. iodoform-glycerin emulsion and a light iodoform-gauze dressing. The author declares himself opposed to the too conservative methods of treatment in tuberculous disease, and advises early operation. He also favors the use of an iodoform emulsion as a dressing in all wounds. The only drainage he employs is that produced by compressive dressings.—*Cent. für Chir.*, 1895, No. 7.

Craniectomy (Lannelongue's Operation) for Microcephalism and Idiocy.

Beck (*Prager med. Woch.*, 1894, Nos. 39–45) attempts to bring this operation again into favor. He has collected a number of cases and added to them two of his own, and formulates exact indications for the operation. The following conclusions are given:

1. Microcephalism is an agenesia of the central nervous system.
2. The changes in the skull are only results of this agenesia (deficiency in growth and early ossification).
3. Frequently there is present at the same time a lack of development in the spinal canal (micromyelia).
4. This agenesia can arise at any period of embryonal life.
5. Pathological alterations may be present at the same time.

From these conclusions it may be assumed that operative interference is without value, as it only alters a pathological condition without acting upon its source. The results, however, shown in the cases collected by this author would lead to an entirely different conclusion.—*Cent. für Chir.*, 1895, No. 10.

The Treatment of Goitre by Thyroid-diet.

The researches of Bruns (*Beiträge zur klin. Chir.*, Band xiii. Heft 1; *Cent. für Chir.*, 1895, No. 13) and others have shown that the thyroid-diet exerts a specific influence in many forms of goitre, and causes either a rapid decrease in size or their total disappearance. The exceptions are the cystic goitres, malignant goitres, and those seen in Basedow's disease; the latter are, however, influenced in a slight degree. The dose employed was ʒijss. of the fresh gland in eight days for adults and gr. lxxv. for children; larger doses produce the well-known symptoms of poisoning.

Of the sixty cases under treatment fourteen were entirely cured, twenty were relieved of troublesome symptoms, but the goitre did not entirely disappear; nine were improved, while seventeen were not affected. The result of treatment was observable after eight days. In cases where relapse occurred the troublesome symptoms, as breathlessness, did not recur. The treatment is also of great value in removing symptoms that remain after a partial thyroidectomy. In cases where the result has not been perfect the subsequent operation has been greatly facilitated by the decrease in the size of the lobules and increase in connective tissue. The good results of this treatment are observed principally in the hypertrophic forms of goitre, which tends to show that the hypertrophies are due to an increased need of the system.

A Case of Internal Choledocho-duodenostomy for an Impacted Gall-stone.

Kocher (*Corr. für Schweizer Aërzte*, April 1, 1895) reports a very interesting case of impacted gall-stone in the ductus choledochus. The gall-bladder was not large and had very little bile in it. By displacing the other intestines the duodenum was exposed, and a finger passed behind it discovered a stone the size of a pigeon's egg in the choledochus behind the duodenum. The stone was very hard, and it was impossible to crush it with the forceps. It was also impossible to break down the adhesions and displace the duodenum, and hemorrhage from the head of the pancreas which was produced in the attempt, had to be stopped by tamponing.

The only method remaining was to attack the stone through the duodenum. The middle left finger of the operator was placed behind the stone and the duodenum, lifting them up. An assistant pressed the duodenum down upon this finger from above. The anterior wall was then cut transversely across its entire width; then an incision was made longitudinally through the posterior wall and the choledochus, so that the stone could be removed. The choledochus was then sewn to the wall of the duodenum, forming a fistula between the two, and the anterior wound was closed. The external wound was tamponed and drained by two drainage-tubes, and allowed to granulate. The patient recovered completely.

The Final Results in Radical Operations for Reducible Herniæ.

Beresowsky (*Deut. Zeitschr. für Chir.*, 1895, Band xxxix. Hefte 3 und 4), after studying the various methods and describing the one he now favors, concludes his valuable study with the following summary:

1. The indications for operation which during the past year (1892–93) have been held in the Berne Clinic, are confirmed by the last 220 operations. The wish of the patient may be considered a sufficient indication, since the mortality is *nil* and the percentage of relapses is very slight.

2. The size and the age of the hernise have an influence on the period of recovery, and in most cases with regard also to recurrence.

3. The age of the patient—*i. e.*, the laxness of the abdominal walls—influences in no manner the result of the operation or the rapidity of the healing; it has a slightly greater influence upon the prognosis as regard recurrence.

In case of operation for inguinal hernia under the above conditions a relapse of the original hernia is not so frequently observed as a return in some other locality which has no relation to the former area, and is apparently due entirely to the relaxation of the abdominal parietes.

4. Thanks to the good course of the operation and wounds, the operation for oblique inguinal hernia can be performed upon children at an early age.

5. The best method for performing the radical cure for oblique inguinal hernia, the author considers, is the last manifestation of Kocher's method, since, in the first place, it produces not less certain results, as far as recurrence is concerned, than the already known best methods (Macewen, Bassini); and, secondly, since this method, on account of the simplicity of its technique and the harmlessness to the patient, if there should be any accident in the process of healing, has decided advantages.

6. In order to prevent recurrences it is very necessary during the operation to observe the condition of the spermatic veins, and in case a varicocele is ever produced it should be operated upon as speedily and thoroughly as possible.

7. The wearing of a truss after a properly performed operation, followed by primary union, is entirely unnecessary, since the majority of the patients, laborers, sent out from the clinic remain free from relapse without wearing any form of truss or protection over the wound.

The Radical Cure of Umbilical Hernia.

Tillaux (*La Scur. Méd.*, March 9, 1895) describes a modification devised by his assistant, Dauriac. The method consists in making two longitudinal incisions in the recti muscles in the middle third of their length, dividing them into two bands. The internal bands, including the anterior portion of their sheaths, are divided transversely at their superior extremities, while the two external portions remain to preserve the continuity of the recti. After their detachment the two bands are much less retracted, this permits of their being crossed over the point where the umbilical opening formerly existed. Their superior extremities are thus transposed, each uniting with the rectus of the opposite side, at the point where the other was removed.

Intestinal Occlusions after Laparotomies.

The conclusions formulated by Adenot (*Gaz. Hebdom. de méd. et de Chir.*, March 18, 1895), after a careful study of this subject, are of extreme value. His summary is as follows:

A certain considerable number of post-operative occlusions of the intestines are due to the physiological impermeability of the left subcostal angle of the colon.

When the small intestine is placed in a plane posterior to the angle of the colon, this angle is not compressed and its permeability is less liable to be interfered with.

Catheterism of the rectum with Faucher's tubes may succeed in some cases, whether associated with gases or fluids or not, in relieving the strictures.

The introduction of a flexible tube is not always feasible, as it may be-

come folded up in the rectum; the rectal sound should be used with great care, so that it may not injure the mucous membrane of the rectum.

During a laparotomy it is advisable to displace any portions of the small intestine that may threaten from their position to compress the colon at this angle by its distention.

It appears preferable to purge mildly from the first to the third days after operation, to prevent the recurrence of a marked meteorism. Meteorism of itself is a cause of impermeability of the left subcostal colic angle.

If an occlusion should form after the laparotomy, one should not hesitate to reopen the abdomen. Of the causes which one should seek for the production of the occlusion, one should not forget the occlusion of the left colic angle by the causes enumerated above.

Some of the Indications for Operation in Head-injuries.

Bullard (*Boston Med. and Surg. Journ.*, January 24, 1895), in a paper in which he discusses this subject, gives the following as rules for operating in these cases:

(1) Be sure that the opening in the cranium is sufficiently large.

(2) Always open the dura where there is evidence of intra-dural pressure.

(3) Remember that in these operations time is an important factor. Do what has to be done as rapidly as possible. In children many deaths are caused in these operations by loss of time.

(4) In an exploratory operation, where it is not certain that a large extra-dural clot exists, look out for the middle meningeal artery.

(5) It is perhaps scarcely necessary to mention that all cases of intra-cranial hemorrhage with which the surgeon has to deal can be stopped by pressure.

(6) I am inclined to think that the present tendency is to remove the packing from the intracranial cavity too early.

The Treatment of the Paraplegia of Pott's Disease by Lateral Drainage.

Ménard (*Rev. d'Orthopédie*, March, 1895), in the course of a laminectomy for the relief of the paraplegia of this disease, observed that he did not obtain any result except in cases where there was a tuberculous abscess opened during the operation, and deduced the conclusion that it is possible that the success was not due to the opening of the spinal canal, but to the accidental opening and drainage of the tubercular abscess. The confirmation of this hypothesis was seen in the recovery of two patients upon whom he practised the direct opening and drainage of the abscess-cavity without the opening of the spinal canal. One was the case upon which an unsuccessful laminectomy had been performed previously, and the other had never been operated upon. In both cases the paraplegia commenced to disappear immediately after drainage had been established. The author reports three other cases in which the paraplegia had existed for some time, and which was relieved speedily by this drainage. The immediate results in these three cases are of great interest. A few hours after the opening of the tuberculous abscess the patients felt a sensation of greater freedom in the lower extremities. The

voluntary movements began to increase in intensity from the first day. They developed progressively, until at the end of the tenth, fifteenth, and twenty-fifth days they were able to stand, and walking began to be possible. Other phenomena began gradually to assume the normal condition. The operation is performed as follows: An incision two to three inches in length is made in a transverse direction, exposing the portion of the spinal column corresponding to the angle of curvature. The transverse process of one of the vertebra is then removed subperiosteally from its attachment to the rib and torn away as deeply as possible at its vertebral attachment. The grooved director is then pushed beneath the periosteum and the lateral aspect of the vertebra explored and the abscess discovered. Pus usually shows itself as soon as the lateral process is removed, the grooved director only serving to enlarge the opening. The permanence of the results obtained is attested by the absence of the paraplegia fourteen, eleven, and ten months after the operation in the first three cases, and the persistent improvement in all cases operated upon.

Compensatory Hypertrophy of the Fibula following Osteomyelitis of the Tibia.

A remarkable case of compensatory hypertrophy of a bone is reported by Marchant (*Rev. d'Orthopédie*, March, 1895). The patient was operated upon for an osteomyelitis of an aggravated character; at that time the patient was thirteen years of age. There were multiple foci found in the thumb, clavicle, and especially in the right tibia and its articulation at the knee. The resection extended from the tuberosity of the tibia to two and one-half inches above the tibio-tarsal articulation. The periosteum was almost entirely destroyed in the upper part of this wound, and an arthrotomy of the knee was necessary. The patient was seen again six years after this operation. The leg had a curvature which had its convexity internally. The region of the knee was greatly enlarged. The middle portion of the tibia was almost entirely wanting, while the internal malleolus maintained its normal appearance. The knee was deformed by the presence on the inner side and posteriorly of the head of the fibula; the styloid apophysis of the fibula was on a line with the upper border of the patella, having been pressed there by the weight of the body and lack of development in the tibia. The foot maintained its normal relations, the hypertrophy existing in the fibula in its upper and middle thirds, where it was greatly thickened in the antero-posterior direction and on the anterior surface. There was considerable shortening, but movement remained very good to a right-angle, and walking was easy without mechanical assistance.

Antitoxin Exanthema.

Asch details a case (*Berliner klinische Wochenschrift*, 1894, No. 51) of mild diphtheria in which, on the first day of the disease, 10 c.cm. of Behring's No. 1 serum were injected. On the following day 5 c.cm. of No. 2 were injected. Two days later an urticarial eruption appeared at the points of injection on the flexor surface of the thighs. In five days the patient was out of bed, but a week later was obliged to return with fever, accelerated, small

pulse, frequent and painful respiration, and somnolence. An eruption appeared on the legs, having all the characters of erythema multiforme. On the arms and face, breast and abdomen, there was a scarlatiniform rash. The patient gradually recovered.

The author thinks there is no doubt that this was a supplementary disease caused by the serum.

Carcinoma Linguæ.

In treating of this most interesting subject, Anderson (*The Quarterly Medical Journal*, January, 1895) calls attention to the fact that precancerous conditions, which at the outset may appear benign, have grafted upon them a cancerous condition; therefore, no surgical lesion of the tongue, unless it be of a merely transitory nature, must be regarded as unimportant. In every sore of doubtful character, a portion of the diseased tissue should be excised and examined under the microscope. The piece should not be a mere fragment snipped off with the scissors; such an investigation could only mislead. Cocaine should be injected and a substantial piece of tissue, including the substance of the sore and a little margin, should be removed. The sections for examination should be cut at right-angles to the surface of the sore. If this examination does not give a clear diagnosis in either way, give the benefit of the doubt to the patient, and not to the disease: excise the peccant tissues. In case of declared carcinoma, excise without a single day of unnecessary delay. The chief objects aimed at by the surgeon in operating are three: to prevent hemorrhage, to prevent the entrance of blood and septic matters from the mouth into the air-passages, and to extirpate the growth as completely as possible. Excision of the growth may best be undertaken in all but exceptional cases, after ligation of the lingual artery (on one or both sides) at its origin. This is accomplished by a section downward from the angle of the jaw through a point a little behind the tip of the greater cornu of the hyoid bone, which will enable the finger, after displacing the submaxillary salivary gland, to feel the pulsation of the external carotid artery, and the main vessel is exposed after ligation and division of any veins that may be in the way. The facial and lingual arteries springing from the front of the trunk, either separately or by a common stem, are to be seen, and we may tie one or both. All enlarged glands should be removed at the same time for histological examination. The tongue should be excised with scissors, leaving a wide margin of healthy tissue, especially in the direction of the floor of the mouth. The submaxillary triangle should be closely watched; and if recurrence in this situation becomes evident, or even before this evidence appears, should the examination of the glands originally excised prove that extension has taken place, the whole triangle should be cleared after ligature of the carotid artery.

Castration for the Relief of Hypertrophy of the Prostate.

In a paper before the Medical Society of the State of California, Bard, of Ventura, after discussing briefly the theory upon which this operation is based, gives to Professor White the credit of first suggesting that as oöphorectomy usually results in decrease of uterine fibroids, so castration in man

would probably be followed by atrophy of an enlarged prostate gland. The arguments upon which this suggestion was based, and the experiments on dogs, which confirmed the theoretical conclusions reached by Dr. White, were published originally in the *Annals of Surgery* for August, 1893. These have been abstracted and quoted so frequently in the medical press, both at home and abroad, that the subject must now be familiar to all who keep in touch with current medical literature.

The author reported a case with marked hypertrophy of the prostate of several years' standing, accompanied by the usual train of symptoms. Double castration was followed by prompt amelioration of the distressing symptoms.

The statement that no physical effects occur after castration, after puberty and in middle life, is certainly borne out by the experience of a large number of careful operators.

A Study in Technique of Operation upon the Appendix.

Dawbarn describes in the *International Journal of Surgery*, 1895, vol. viii. No. 8, the following method of dealing with the stump after removal of the appendix, which he has employed since 1890 in all suitable cases:

1. A continuous Lembert suture of silk is made to surround the appendix, running like a purse-string or gathering-string, in the superficial layers of the cæcum, one-fourth inch from the appendix. This suture is not yet tightened, although the first half of a surgeon's knot is already made.

2. The appendix is divided, leaving a stump of variable length, but never shorter than a half-inch.

3. This stump is stretched for a moment gently by introducing through its calibre a closed pair of slender, mouse-toothed forceps, passing them into the cæcum, and gently opening the blades; thereby any stricture from swelling of mucous membrane or from plastic deposit will be stretched, and the next step will be the easier in consequence.

4. The stump is seized at the extreme of its free end by a similar fine-pointed pair of mouse-toothed forceps, and the stump is promptly invaginated —turned "outside in"—as a glove finger might be. So that when completed the forceps and appendix-end are one-half inch *inside* the cæcum.

5. The suture is now tightened, during which step the forceps are withdrawn. Sometimes it is a help to insert a probe or grooved director between the open jaws of the forceps prior to withdrawing the latter, in order to prevent the appendix drawing itself out again with them.

Two points in the technique should be noted: the use of dry sterile gauze to hold the viscera, to prevent slipping, and pressure of the thumb and finger upon the cæcum near the appendicular attachment to prevent the escape of fecal contents during the manipulations.

On the Treatment of Secondary Hemorrhage from the Arteries of the Upper Extremity.

Platt describes four cases of secondary hemorrhage of the upper extremity in the *Medical Chronicle*, vol. iii., No. 2, which he uses as a text for some remarks upon the treatment of this accident. Two of the cases presented clean wounds—one involving the ulnar artery and the other the superficial palmar

arch—both had been inflicted some days previously. It was quite easy to ligate both ends of the divided vessel by slightly enlarging the wound. Healing was rapid and satisfactory, and there was no further trouble.

The third and fourth cases are of special interest, as both wounds were sloughing. In one a suppurating adenitis, secondary to an infected wound of the thumb, eroded a small branch of the brachial artery near the main trunk, and in the other a punctured wound involving the radial artery had been packed so tightly that sloughing occurred. In the former, as it was impossible to ligate the injured vessel on account of the close proximity of the wound to the brachial artery, the latter was ligated with silk above and below the origin of the branch involved. The hemorrhage recurred, however, and depended upon the ligatures becoming septic and cutting through the vessel and coming away before the wound had healed. The author decided to trace the divided artery up and down until its walls were found healthy and to apply torsion. In the fourth case, after completely dividing the wounded artery, both ends were twisted. Both cases made an uninterrupted recovery. The author strongly advises the treatment applied in the last two patients in similar cases. He prefers torsion to ligature, which leaves a foreigh body in the wound.

EXTRA-PERITONEAL CLOSURE OF ARTIFICIAL ANUS AND FECAL FISTULA.

J. GREIG SMITH describes in the *Bristol Medico-Chirurgical Journal*, vol. xiii., No. 47, the method which he has successfully employed in closing cases of artificial anus and fecal fistula. The object sought is to perform enterorrhaphy without opening the general peritoneal cavity. The author thinks too much has been made of the agglutination of peritoneal surfaces in abdominal surgery. It is by no means certain, he says, that two opposed surfaces of intact peritoneum unite as quickly as two surfaces denuded of peritoneum, and he insists that an opening in the gut can be closed as satisfactorily and as speedily by the apposition of rough cicatricial tissue on its surface as by the apposition of intact peritoneum.

Between the parietal peritoneum and any discharging intestinal openin is a circle of adhesions binding the bowel to the parietes. In the operation to be described these adhesions are left undisturbed. The bowel is delivered through an incision carried above and below the parietal opening, along with parietal peritoneum, which is separated from the parietes to any desired extent. The chief feature in the operation is this separation of parietal peritoneum, with its fat all around the fistula, for a distance of one or two inches, as is found necessary. The detachment should be begun at a distance from the fistula and carried down to it; it may be done almost entirely with the fingers.

In a case of fecal fistula the bowel does not protrude through the parietal opening, and there is no spur, or only a slight one. A simple fistula leads from the skin to the bowel. The first step in the operation is the scraping of the granulations lining the fistula, which is done with a sharp Volkmann's spoon. If there is any discharge from the intestine, a small sponge with a string attached is pushed through the fistula so as to block it. An incision is then made in the direction of the underlying muscular fibres, with the fistula in the centre; the incision does not pass through the fistula, but is

carried around it. The fistula, with the cicatricial tissue surrounding it, is removed bodily. The parietal peritoneum, with its areolar tissue, is separated with the finger for a distance of one or two inches all around. When the separation is complete the fistulous tract is removed down to the gut. The bowel is now lifted out of the parietal incision by means of forceps, and the opening closed by infolding the raw surfaces and uniting with Lembert's sutures. This is followed by a continuous (Dupuytren's) suture. The parietal wound is then closed. A small drainage-tube laid over the line of gut sutures adds to the security of the operation by preventing burrowing.

In cases of artificial anus there is almost always a spur present, in which case it is necessary to devote a few days to removing this condition. For this purpose the method adopted by Mitchel Banks is recommended. This consists in introducing a piece of rubber-tubing of proper size in the bowel, by being put upon the stretch during its introduction one of large calibre may be employed; it is anchored by a piece of aluminum wire which passes into, but not through, the wall of the tube. In a few days the spur will have been removed and the lower segment of the bowel will have been dilated, and the tube may then be withdrawn. Two days may be allowed for the irritation caused by the tube to subside before the final step in the operation is performed. The incisions are made as already described for fecal fistula, and the succeeding steps are also carried out in the same manner. Free detachment of the parietal peritoneum, with accurate suturing of the bowel, is the most important element of success.

Stone in the Bladder.

In a recent clinical lecture, Heath (*Brit. Med. Journ.*, June 1, 1895) says that "If you have these symptoms—increased frequency of micturition, pain after emptying the bladder, pain at the end of the penis, and occasional passage of blood—you will conclude that the patient has a stone, and you will be quite justified in sounding that patient; and you will have no difficulty in touching the stone if it is anything of a size. In case a stone is not found, the patient should be sounded on a second occasion under chloroform or an anæsthetic. In cases of enlarged prostate the surgeon may not push the sound completely into the bladder. He uses the sound in the usual fashion, rotating it in the prostatic urethra, and may easily fancy that there is no stone present; but if he pushed the sound well up into the bladder, he would find the stone. You should make sure, therefore, that you have pushed the sound well up into the bladder, and directly the sound has entered turn it down and explore behind the prostate. Then comes the question, Shall you or shall you not have some water in the bladder? Well, you ought to have some, and I take it that whatever is in the bladder at the time will probably be enough; but if you fail to detect the stone, there may be more water than you want, so it is convenient to use a hollow sound to enable you to draw the water off, and as you do so you may feel the stone click against the sound."

In doing the suprapubic operation the author did not use the Peterson bag to distend the rectum and used air to distend the bladder. It was the first time he had done so, but he considers it a good plan. The method was

suggested by Bristow. Having washed out the bladder he filled it with air, leaving the catheter *in situ* to assist in raising the apex of the bladder if it was desirable. "Having felt that the bladder was fairly well distended, I made an incision immediately above and on the pubes, about two and a half inches in length. I then worked in carefully between the muscles, and, having exposed the fat and cellular tissue, I came on the bladder with my finger, and then in order to keep it within reach I passed two threads with a curved needle, one on each side, to hold the bladder in position; next I scraped a little on the muscular fibres of the bladder, taking care to avoid some veins. I was then able to open the bladder in the middle line without any difficulty, and the air immediately escaped. There is this advantage of the air over water distention, that the air escapes easily and there is no mess. There is also another consideration, if there is a sudden rush of water it may wash out with it a small calculus, which may get lost." The author also insisted upon the necessity of sounding under an anæsthetic just before operating. In the after-treatment he uses a flanged rubber tube, fastening a sheet of oiled silk beneath the flange and attaching it to the pubes with plaster. In regard to methods, he says: The suprapubic method seems so thoroughly to have established itself among surgeons that one may reasonably look forward to its being the operation in the future.

DISEASES OF THE LARYNX AND CONTIGUOUS STRUCTURES.

UNDER THE CHARGE OF

J. SOLIS-COHEN, M.D.,

OF PHILADELPHIA.

The Rhino-pharynx and the Lachrymal Passages.

In the *Ophthalmic Record*, 1895, No. 9, Dr. C. A. Veasey calls attention to the importance of active treatment of the rhino-pharynx in the treatment of obstructive disease of the lachrymal passages, and illustrates his remarks by five cases, as follows:

Case I. Purulent dacryo-cystitis; hypertrophy of right lower turbinated bone.

Case II. Purulent dacryo-cystitis; hypertrophy of inferior turbinated bone on both sides, with a spur of the septum on the right.

Case III. Catarrhal dacryo-cystitis; hypertrophic rhinitis, with deviation of the septum to the left.

Case IV. Epiphora; polypus; hypertrophy of right inferior turbinate.

Case V. Lachrymal abscess; syphilitic ulceration of septum; marks of former ulceration in pharynx.

An Extraordinary Case of Syphilis of the Tonsils.

Dr. J. Sendziak, of Warsaw, reports (*Revue de Laryngologie, d'Otologie et de Rhinologie*, 1895, No. 9) the case. For several weeks this case had been

considered to be a case of diphtheria, then it was thought that perhaps it might be an example of fibrinous angina or of a new form of mycosis, and finally it was mistaken for sarcoma. After a prolonged continuance the anti-syphilitic test was applied in treatment, with the result of promptly clearing up the diagnosis in the cure of the case. Three weeks after the commencement of the disease the right tonsil was enlarged in its vertical diameter to such an extent as considerably to occlude the isthmus of the throat. It was entirely covered with a white membrane, slightly bluish, thick and lardaceous, and incapable of separation from the parenchyma of the tonsil. The total aspect was that of a tonsil which had been entirely covered with the products of a topical application of silver nitrate in substance.

In concluding his report, the writer cites a case of supposed cancer of the larynx sent to Wiesbaden for laryngectomy, in which specific treatment suggested by Dr. B. Fraenkel completely cured a syphilitic laryngitis.

Atrophic Rhinitis.

Dr. Joseph Gibb (*Medical News*, December 8, 1894) calls attention to the value of zinc stearate in the treatment of atrophic rhinitis, and details the plan pursued by him in the Episcopal Hospital of Philadelphia.

Abscess of the Nasal Septum.

Dr. Joseph S. Gibb (*Codex Medicus Philadelphiæ*, February, 1895) reports two cases of septal abscess, one acute and the other chronic, in which some injury was believed to be the exciting cause, although there was no such history. These are the only two cases seen at the Episcopal Hospital out of 2000 cases of nasal disease.

Closure of a Laryngeal Fistula.

Dr. Clayton Parkhill, of Denver, Colorado, reports (*International Medical Magazine*, February, 1895) a case of closure of the laryngeal fistula by turning up the flap below, skin inward, in a male subject who had attempted suicide with a razor.

This method of closure, though one of the best, is not, however, new, a number being on record; one by the writer of these notes, reported in *The Medical News*, December 9, 1893.

In hairy subjects, however, this method is not desirable for obvious reasons.

Forced Dilatation of the Larynx. Intubation.

Dr. Louis Bors advocates (*New York Medical Journal*, 1895, No. 26) forced dilatation of the larynx with a hinged intubation-tube for diphtheritic or croupous laryngitis. He asserts that the manipulation is harmless and painless, and requires only a few minutes in the manipulation. By this method he proposes to supersede the continuous presence of the intubation-tube. While he does not record any cases in detail, he claims these good results in a general way.

The difficulty experienced in removing the tubes of intubation has

prompted a number of devices for the purpose. One of the most recent is described and illustrated by DR. DILLON-BROWN (*Medical News*, July 6, 1895). This consists practically of a hook attached to a skeleton thimble for the forefinger. The hook catches in a metallic loop which surmounts the intubation-tube and thus pulls it readily away.

A still simpler suggestion is made by DR. RAOUL BAYEUX, an interne á l'hôpital Trousseau (*La Médecine Moderne*, 1895, No. 42), who shortens O'Dwyer's tube by cutting off the entire sub-ventricular portion. He is then able to remove it with his finger. He claims that the tube is quite as firm as a long one, and that it is much less likely to become obstructed with false membrane or to become encrusted exteriorly.

STRIDULOUS LARYNGITIS AND DIPHTHERIA.

DR. BONAIN, of Brest (*Revue de Laryngologie, d'Otologie et de Rhinologie*, 1895, No. 9), reports two cases in which unsuspected diphtheria seems to have been the cause of stridulous laryngitis. In two patients, aged two and six years, respectively, attacked with laryngitis, the doctor was unable to detect any evidence of pelliculation. Nevertheless, he removed some of the mucus for culture-purposes and was astonished to find the diphtheria bacillus. Both patients were treated with injections of antidiphtheritic serum and recovered promptly.

The author suggests that stridulous laryngitis may not always be simply a nervous affection, and that it may be caused by the irritation due to the presence of unsuspected diphtheria bacilli, and he therefore recommends that similar culture-investigations be taken in these cases as in suspected diphtheria.

LARYNGEAL PARALYSIS AND TYPHOID FEVER.

DR. W. LUBLINSKI, of Berlin, reports (*Annales des Mal. de l'Oreille du Larynx*, etc., 1895, No. 4) five cases, four of them in males. Paralysis of the dilators occurred in one case, paralysis of one recurrent nerve in three cases, and paralysis of both recurrents in one case. Of the three cases of paralysis of the recurrent, one was first a paralysis of the right abductor and then of the recurrent in its totality, and two of them were paralysis of the left recurrent. One of these latter was accompanied with a slight paralysis of the lower limbs, and occurred during the febrile period of the disease. The other four occurred after defervescence.

MALIGNANT GROWTHS OF THE LARYNX.

In the *New York Medical Journal* of November 10, 1894, DR. ARTHUR AMES BLISS reports a case of epithelioma and one of sarcoma of the larynx; the former in a printer, forty-six years of age, and the latter in a laborer, fifty-five years of age, accompanied with a good photographic illustration of a specimen secured at the autopsy.

In both instances life was prolonged by tracheotomy, the more radical procedure having been declined, although the conditions in both instances seemed to be favorable for partial laryngectomy.

The case of epithelioma died suddenly from heart-failure in an attack of angina pectoris about four weeks after operation, and the case of sarcoma succumbed from exhaustion a year after the operation.

OBSTETRICS.

UNDER THE CHARGE OF
EDWARD P. DAVIS, A.M., M.D.,
PROFESSOR OF OBSTETRICS AND DISEASES OF INFANCY IN THE PHILADELPHIA POLYCLINIC; CLINICAL PROFESSOR OF OBSTETRICS IN THE JEFFERSON MEDICAL COLLEGE; CLINICAL PROFESSOR OF DISEASES OF CHILDREN IN THE WOMAN'S MEDICAL COLLEGE; VISITING OBSTETRICIAN TO THE PHILADELPHIA HOSPITAL, ETC.;
ASSISTED BY
WILLIAM H. WELLS, M.D.,
INSTRUCTOR IN OBSTETRICS IN THE PHILADELPHIA POLYCLINIC.

A Delivery-stool in Use at the Present Time in Spain.

In the *Edinburgh Medical Journal*, page 771, 1895, SIMPSON describes a vessel made of strong, glazed earthenware, having a gap or opening in the anterior wall, and used at the present time by the physicians in Spain in confinement-cases. This jar or stool has a wide flange upon which a patient sits, leaning forward, while the gap in the anterior wall of the jar permits necessary examinations and the expulsion of the child. Amniotic liquid and blood escape into the jar. Simpson commends this delivery-stool for its simplicity, and for the fact that it permits absolute cleanliness.

Complete Inversion of the Parturient Uterus.

In the *Zeitschrift für Geburtshülfe und Gynäkologie*, Band xxxi, Heft 2, BECKMANN reports the case of a primipara, aged twenty-three years, who bore a child in normal labor in very rapid spontaneous delivery. The umbilical cord was coiled once around the neck, passing under the axilla. Immediately after the birth of the child the patient felt well, but had no further pains. Half an hour after the expulsion of the child strong pains began suddenly, accompanied by bearing-down efforts. A stream of blood was suddenly ejected from the vulva. After a few strong bearing-down pains the bleeding ceased, and also the uterine contractions. The midwife in attendance was terrified at the hemorrhage, and sent immediately for Beckmann; he found the patient in shock, and on endeavoring to palpate the uterus could not find it. Vaginal examination showed a complete inversion, with the placenta partially adherent. This was immediately removed, and an endeavor made to dilate the contraction-ring and replace the uterus. This effort failed, when a hot douche with 2 per cent. carbolic acid was employed freely to act as a stimulant. A second attempt without anæsthesia was successful, the uterus suddenly inverting under the pressure of the hand. It was again douched with hot car-

bolic acid solution, and a thorough examination revealed the pelvic organs uninjured. The condition of shock was treated by injections of camphor and ether, and by rectal injections, every three hours, of normal saline solution. The patient was given champagne frequently, and other stimulants were used hypodermatically. A complete recovery ensued. A thorough examination of the case showed that the midwife had neither pulled upon the cord nor had she attempted to express the placenta by Créde's method.

Beckmann has collected one hundred cases and studied the mode in which the accident happened. He concludes from his studies that most cases happen without interference or manipulation on the part of the midwife or physician attending the case. Most cases occur in patients between the ages of twenty and thirty years, when strong and vigorous expulsive efforts are likely to occur. He believes that vigorous spontaneous expulsion of the child is the chief cause for this accident.

The Treatment of Labor when the Posterior Parietal Bone Presents.

Under this title Goenner (*Zeitschrift für Geburtshülfe und Gynäkologie*, Band xxxi. Heft 2) reports eight cases, seven of which occurred in contracted pelves, two simple flat pelves, three flat rhachitic, and one symmetrically contracted. Three of the children survived, and all of the mothers. In one case the uterus was ruptured and abdominal section performed. In one case the mother delivered herself after the position of the head was rectified by the introduction of the hand. One case was delivered by forceps, which corrected the position of the head. In the remaining cases it was necessary to turn, to use forceps, and in several to perforate to deliver the child. The favorable results for the mother indicate that the prognosis in these cases is good if operation is promptly undertaken.

The Height of the Fundus Uteri at Various Stages of Labor.

Fothergill has measured the distance from the fundus uteri to the upper margin of the pubic joint during the first stage of labor and during the second stage. He also measured the breadth of the uterus in different stages and its length. His results showed that the fundus rises three-tenths of an inch before birth; the uterus becomes narrowed laterally one and one-tenth inches before labor ends, while the measurement from the fundus to the pubes lessens one inch before birth. The length of the parturient canal is not shortened before delivery; as the child passes through the uterus into the vagina the womb grows narrow, while as labor advances the uterus is contracted antero-posteriorly. The cubic contents of the uterus are lessened. The fundus does not sink before the birth of the head.—*Edinburgh Medical Journal*, June, 1895.

Hysteria and Dementia in Pregnancy, with Fœtal Contractures.

Barbour (*Ibid.*) reports the case of a woman, aged twenty years, unmarried, who was well during pregnancy until fœtal movements developed, and she was subjected to mental shock because of her condition. She was then seized

with attacks of hysterical paralysis, which produced a condition closely resembling dementia. Muscular contractures with areas of anæsthesia developed. Labor came on spontaneously, with epileptiform spasms with each pain, fever, and rapid pulse. The fœtus died during labor. The pulse failed and delivery was completed by forceps. From the moment when the membranes ruptured the temperature declined, becoming normal. Paralysis disappeared, but impairment of sensation and contractures remained. Temporary improvement followed labor, with return of sleep and appetite. The patient, however, failed and died with high temperature.

Post-mortem examination showed thickening of the membranes of the brain, with softening on the right side, involving the internal capsule and extending to the base.

The body of the fœtus showed the same contractures which the mother exhibited, including a peculiar attitude of the right arm and hand. This was not due to *rigor mortis*, but was proved by dissection to be due to muscular contraction.

Dystocia following Hysteropexy; Delivery by Cæsarean Section.

In *La Semaine Médicale*, 1895, No. 29, Goubaroff reports an interesting case of Cæsarean section in the Dorpat Clinic, made necessary by previous anterior suspension of the uterus. Four years previously the patient had been treated for retroversion and retroflexion by anterior suspension. Upon examination the pregnant uterus was so firmly adherent to the abdominal wall that rupture of the uterus was feared if spontaneous labor was permitted. On opening the abdomen the uterus was found adherent by a solid band, extending longitudinally, the width of a finger. At the fundus was found a solid bridle which required clamping and division. To avoid further adhesions the uterus was incised, the fœtus extracted, and the edges of the uterine wound sutured, leaving no raw surfaces.

The Treatment of Fœtal Impaction by Cleidotomy.

Phanomenoff draws attention to the difficulty of delivering large children by reason of impaction of the shoulders. When he has failed to deliver by rotating the shoulders into an oblique diameter of the pelvis, he has had good success by cutting both clavicles with blunt-pointed scissors. He describes a case of symmetrically contracted pelvis in which he delivered a child weighing thirteen pounds by this method. The left hand is introduced as a guide, and each clavicle severed at its inner end. The scissors are blunt-pointed and curved at an angle.—*Centralblatt für Gynäkalogie*, 1895, No. 22.

Schultze's Method of Resuscitation in Cases of Fractured Clavicle.

Beuttner reports (*Centralblatt für Gynäkologie*, 1895, No. 22) a case of difficult extraction in breech-presentation, in which the child was resuscitated by Schultze's method of swinging. It perished shortly after birth from the

effects of pressure upon the head. Autopsy revealed the fact that it had a broken clavicle. Swinging, however, had not injured the pleura or lungs, nor displaced the fragments.

GYNECOLOGY.

UNDER THE CHARGE OF

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Ileus due to Pressure of an Ovarian Cyst.

Peters (*Centralblatt für Gynäkologie*, 1895, No. 13) reports a case of ileus due to simple pressure of an ovarian cyst. In the other twelve reported cases the obstruction was due to torsion of the pedicle. The patient, aged sixty years, had had an abdominal tumor for ten years, with symptoms of intestinal obstruction of a year's standing. The writer was called to see her on account of a sudden attack of abdominal pain. She had had no movement of the bowels for four days; two small stools followed the administration of high enemata. On examination the abdomen was found to be tympanitic, a cystic tumor as large as a man's head being detected, which filled the pelvis. There was an umbilical hernia the size of the fist, which contained omentum, but no intestine. General abdominal pain and tenderness; pulse small and rapid; temperature normal; nausea without vomiting. The diagnosis of ovarian tumor with torsion of the pedicle was made, but on opening the abdomen the obstruction was found to be due to direct pressure of an adherent papillomatous cyst upon the cæcum. The patient had a spontaneous evacuation of the bowels two hours after the operation, and made a good recovery.

Supplementary Ovary.

Ruppolt (*Archiv für Gynäkologie*, 1895, No. 14) describes a case of third ovary in a patient who was operated upon for the removal of a small tumor behind the uterus, which caused marked intestinal symptoms. On the right side there was found a dermoid cyst the size of an apple, and nearer to the uterus an atrophied ovary. The presence of ovarian tissue was demonstrated microscopically in both the ovary and the tumor. The presence of old omental adhesions between the two, dividing the tube, would seem to show in this case, as in other similar ones which have been reported, that there is an actual division of both the ovary and tube as the result of peritonitis in the fœtus.

Abdominal Hysterectomy with Clamps.

Richelot (*Annales de Gynécologie et d'Obstétrique*, May, 1895) infers that one of the principal reasons why total extirpation of the uterus is not more

generally adopted in preference to amputation is that the technique of the former operation has been too complicated. He rejects ligatures entirely, using forceps as in vaginal hysterectomy. His technique is as follows: The only instruments needed are a knife, a few pairs of hæmostatic forceps, large and small, and two curved Richelot's clamps, sufficiently long to grasp the entire broad ligament. The operator, standing between the patient's legs, makes the abdominal incision, and lifts the uterus out of the wound. An anterior peritoneal flap is made and the bladder is freed in the usual manner. The index and middle fingers of the left hand are introduced into the vagina as a guide, and the anterior fornix is opened. The cervix is separated from below as high as the bases of the broad ligaments, which are then included, each in a single clamp, introduced from the vagina, the thumb and index finger of the left hand serving as a guide. It then remains simply to divide the uterine attachments of the ligaments and the remainder of the posterior cul-de-sac. Bleeding points are grasped with long hæmostatic forceps from the vaginal side, and a simple gauze tampon is introduced and carried through into the vagina, the abdominal wound being closed. This operation can be completed in half an hour, and doubtless in less time. The writer has performed three by this method, the patients making a good recovery.

[We are not convinced, even by the writer's well-known success with clamps, that his method of removing the fibroid uterus *in toto* by the abdominal route is a more surgical or more successful one than that in which the arteries are ligated and the peritoneal flaps are sutured, thus rendering all the stumps extra-peritoneal and avoiding the necessity of even vaginal drainage.—H. C. C.]

The Technique of Curettage.

Löhlein (*Centralblatt für Gynäkologie*, 1895, No. 14), in comparing the relative advantages of the sharp spoon and curette, says that while the latter is the safer instrument, with the former one can scrape away the mucosa of the fundus, especially at the cornua, more thoroughly. The cutting-edge of the curette glides over the fundal mucous membrane at such a sharp angle that only the superficial epithelium is removed as a rule. The spoon is also preferable in removing intraparietal carcinoma of the cervical canal.

Accidents during Curettage.

Pichevin (*Annales de Gyn. et d'Obstétrique*, May, 1895) has collected all the cases of injury to the uterus by the curette, and groups them as follows:

1. Abortion due to the rough use of the instrument within the gravid uterus, of which many cases are on record.

2. Septic infection, which has not infrequently resulted fatally in pre-aseptic days.

3. Rupture of a pyosalpinx, as in a fatal case reported by Rochet. In the event of such an accident, vaginal hysterectomy or cœliotomy should be performed without delay.

4. Atresia of the uteri after curettage has been noted by Polaillon and Fritsch, but is rare.

5. Perforation is the most frequent accident, a case being reported by Richard as early as 1854, who, as well as Nélaton, called attention to the fact that it is often unattended by serious results. The same observation has been made by many subsequent writers.

As regards the causes of perforation, the writer finds that softening of the uterine wall following pregnancy is the most common, perforation of the non-puerperal uterus during curettage being quite rare. Frequent child-bearing, tuberculosis, and possibly cardiac disease seem to cause certain degenerative changes in the muscular tissue. If the softened uterus is retroflexed and fixed by adhesions, there is especial liability to the accident. Olshausen affirms that it is impossible to foresee and prevent it, an opinion shared by Ozenne, who demonstrated in a non-puerperal uterus a localized area in which the wall was extremely thin.

The seat of the puncture varies, being most apt to occur at the angle of flexion when the uterus is retroflexed and adherent. The most common point is at the cornua, in the neighborhood of the tubal orifices, where the wall is thinnest; as Léfour has shown, inflammatory lesions are most marked in this region. Doubtless the operator has often been at fault through carelessness, inexperience, or undue roughness. In some cases the perforation has been made with a steel dilator, and not with the curette at all.

The diagnosis of the lesion is sometimes made at the time, the operator feeling his curette suddenly slip through the uterine wall, while its extremity is clearly felt by abdominal palpation. Still one may be in error in inferring that he has caused a perforation when the curette suddenly slips into the fundus of a uterus which is deeper than was supposed. It has been explained that the uterus may become suddenly distended during curettage, due to a temporary paralysis of its muscle. The cautious use of the sound under these circumstances will demonstrate the fact that the organ is uniformly dilated. Under bimanual pressure it may be made to contract. Exceptionally the curette may enter the dilated proximal end of the tube, but most of the reported cases are hypothetical. Probably the instrument really slips into one cornu, which is more developed than the other. There is, of course, no doubt as to the occurrence of the accident when omentum or intestine appears at the os externum, as has been reported in several instances. In some cases the perforation was not suspected until fluid was injected into the uterus and failed to return. It seems more rational to infer that the fluid entered the peritoneal cavity by this route than through an abnormally patent tube.

Symptoms may be entirely absent in an aseptic operation. In other cases there may be a chill, rise of temperature, and moderate abdominal pain, without other phenomena. Sometimes, however, a localized peritonitis follows, which may become diffuse, especially in cases of suppurative disease of the adnexa. Slight hernia of the omentum usually gives rise to no symptoms, but if a loop of intestine prolapses through the uterine wound subsequent symptoms of obstruction develop. If the gut is severely injured during the operation, collapse may occur promptly, with a rapidly fatal issue, as in Martin's case. The escape of antiseptic fluids into the peritoneal cavity is attended with various phenomena—colic, chills and fever, and subsequent toxic or septic symptoms.

Certain precautions are necessary in order to avoid the accident. Thorough dilatation of the cervix is advisable before curettage, and two-branched dilators are preferable to any other instruments. The curette is to be used gently, the operator beginning at the fundus and scraping from above downward, parallel with the vertical axis of the canal. The straight curette is dangerous, especially when used in the cornua. Especial care is to be exercised in curetting the uterus after early abortions, and the sharp instrument should never be used in puerperal cases. The injection of iodine or perchloride of iron after curettage is reprehensible as well as unnecessary. Irrigation, preferably with sterilized water, should be practised under moderate pressure, sufficient dilatation of the cervix being maintained to allow a free return-flow.

If a perforation is caused, it is sufficient in the majority of cases to tampon the uterine cavity simply with gauze. Prolapsed omentum should be replaced if possible, or, this failing, the prolapsed portion may be excised. But in the case of a septic uterus it is better to open the abdomen, to excise the omentum, and to suture the uterine wound. The same general rules apply to prolapsed intestine. It may be necessary to resect the gut if it is extensively injured. Extirpation of the uterus is a dangerous operation, especially in the puerperal state. It may be performed under special indications, as when the wall is perforated in enucleating a fibroma. If fluid has been injected into the peritoneal cavity through the perforation, an incision into Douglas's pouch and drainage are indicated in the author's opinion, although vaginal hysterectomy has been advised and performed.

THE SUPPOSED INFLUENCE OF TROPICAL CLIMATE ON MENSTRUATION.

JOUBERT (*Indian Medical Gazette*, April, 1895) from a careful study of this subject, based upon over three thousand patients between the ages of ten and nineteen years, arrives at the conclusion that the reason why girls in tropical countries menstruate at a relatively earlier age than Europeans is not the influence of the climate, but of too early sexual excitement.

REMOVAL OF THE UTERINE APPENDAGES FOR NERVOUS DISEASES.

BAKER (*Ibid.*) concludes a recent paper on this subject with the following summary: 1. Disease of the adnexa is sometimes an unrecognized cause of nervous disease. 2. Nervous manifestations may be due to the adhesions resulting from a former localized perimetritis which impairs the functional activity of the adjacent pelvic organs. 3. The nervous symptoms may be out of proportion to the actual local trouble. 4. A thorough examination under anæsthesia should be made in every obscure case. 5. It may be necessary to remove healthy adnexa in order to cure certain extreme nervous disturbances.

The discussion of this paper turned mainly upon the question of the removal of normal ovaries and tubes, to which the consensus of opinion was decidedly opposed, Knapp and Prince taking the ground that the successful results sometimes noted after these operations were due either to suggestion or to some profound effect on the general nervous system which might have followed any other surgical procedure.

PÆDIATRICS.

UNDER THE CHARGE OF

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HEMORRHAGIC DIPHTHERIA.

H. AUSTEN and H. COGILL (*British Medical Journal*, March 30, 1895) give the notes of fifty-eight cases of hemorrhagic diphtheria occurring in a series of 880 diphtheria cases at the Western Fever Hospital, London, during 1893–94. Recovery occurred in one case, and in this the diagnosis was doubtful, being based on three ecchymoses of possible traumatic origin. In eleven cases the diagnosis was confirmed bacteriologically, six of these cases being of mixed infection. In the other cases the diagnosis rested upon clinical grounds. The fifty-eight cases were about equally divided as regards sex; as to age, twenty-four were under five years, and twenty-seven were from five to ten years. The local symptoms were severe, and the parts affected usually became the seat of hemorrhage. The tonsils and soft palate showed membrane in all cases, the larynx being involved in eighteen, the nose in three, the tongue in two, and the nose and larynx in two. The cutaneous hemorrhages were of two well-marked varieties—ecchymoses and purpuric spots, with occasional intermediate types. Hemorrhages from the mucous membranes were generally severe, epistaxis occurring in eighteen cases, hematemesis in ten, and melæna in two. The usual clinical course was that of a marked toxemia, with subnormal temperature rather than fever, vomiting, weakness of the heart, and a tendency to anuria. In almost every case post-mortem examination revealed internal hemorrhages, affecting most frequently the serous surfaces, but occurring also in the mucous membranes of the stomach and intestines. They were of frequent occurrence in the muscles, and when superficially seated were the cause of ecchymoses noted during life.

The treatment was that usually adopted, and, in addition, twelve received the antitoxin, including the one recovery. Six of these were moribund on admission. In three of the other six temporary improvement followed the injections; and in these the membrane disappeared entirely before death.

Hemorrhagic diphtheria may be compared to the hemorrhagic forms of the other infectious fevers in its uniformly fatal outcome. In diphtheria, however, the disease being primarily local and general manifestations secondary, it is not surprising that the course is more prolonged. Oertel has described degenerative changes in the bloodvessels, and these may determine the seat of hemorrhage.

An Epidemic of Mumps.

The coincidence of an epidemic of pseudo-membranous angina and one of mumps was observed by Pailhas (*La Médecine Infantile*, No. 6, June 15, 1895) in a boarding-school for girls at Albi. Both conditions were present in some of the patients, while others had only one or the other. Endocarditis occurred in one case, which the author attributes to the mumps, the left parotid being slightly swollen and tender: it seems more than likely that this was rheumatic in origin, as fever was present, with a coated tongue and painful swelling of all the joints of the left arm. Jaccoud, however, in 1884, reported two cases of mumps with endocarditis, and thought this complication rare only through its having been overlooked. One of the anginas was accompanied on the fifth day with a general erythema followed by desquamation—possibly a case of scarlet fever. What might be called an inverted type of mumps (alternance répétée) was shown by one case, the onset of which was marked by peri-articular swelling of the ankles, giving metastasis to the submaxillary glands, and leaving these in a few days to attack the right knee. A strange phenomenon in another case was the sudden appearance of numerous varioliform vesicles, associated with a dry cough and abdominal distention, these giving way in two weeks to a typical explosion of mumps. A similar case was observed outside of the school, and the author mentions that such eruptions have formerly been noted in mumps. A dry cough and hoarseness were also among the features noticed in many cases. In discussing the reason for the appearance of such varied manifestations, the author raises the question whether or not the germ of influenza, an epidemic of which was raging at the time, could have a modifying influence upon the causal agent of mumps, so as to give it an irregular action.

PATHOLOGY AND BACTERIOLOGY.

UNDER THE CHARGE OF

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The Influence of Fever and Leucocytosis on the Course of the Infectious Diseases.

In the enthusiastic search for specific curative agents it is to be feared that the study of the influences which conduce to spontaneous recovery from the acute infectious diseases have been in a measure neglected. The importance of a correct knowledge of the manner in which spontaneous cure is effected cannot be overestimated, since any rational cure by artificial means to be

most effective must follow in the same line. A correct understanding, then, of the natural history, so to speak, of the infectious diseases is of the greatest importance.

Of all the symptoms of the acute infectious diseases fever is the most constant, yet of the manner of its production and of its influence upon the course of these diseases we are almost wholly ignorant. At the present time the immediate practical importance of this question is very great, since so large a part of their treatment consists in combating the fever which is so constantly present. The fallacy of such treatment is apparent if in fever we have one of the salutary influences which bring about the natural recovery from these diseases.

In this connection the recent experiments of LOEWY and RICHTER (*Deutsche med. Woch.*, 1895, No. 15, p. 240) are of exceptional interest. By making use of the Sachs-Aronsohn method of puncture of the corpus striatum they were able to induce in rabbits a fever of more or less intensity and of the continued remittent type. When inoculated with virulent cultures of the germs of diphtheria, chicken-cholera, swine-plague, and pneumonia, these animals were much less affected than others similarly inoculated in which fever had not been induced. In the experiments in which one hundred times the fatal dose of chicken-cholera, diphtheria, and pneumonia were used, there was a distinctly slower progress of the disease in the febrile animals, and in the cases where only two or three times the fatal dose was administered the febrile animals recovered. In cases in which the swine-plague was inoculated into the ear-vein of rabbits the local process developed more rapidly in the febrile animals than in the control-animals, but notwithstanding this fact many of them recovered, while the control-animals all died. These results are the more significant since it is but fair to suppose that by the operation necessary to the puncture of the corpus striatum the predisposition of the animals so treated must have been increased.

In their investigation of the effect of an increased number of leucocytes upon the course of various infections in animals, Loewy and Richter induced artificial leucocytosis by means of pilocarpin, spermin, and various albumoses. Animals so treated were resistant to three and four times the fatal dose of the pneumococcus, there being only slight rise of temperature and insignificant symptoms in the cases in which the leucocytosis existed at the time of the inoculation. When the pneumococcus infection was allowed to progress for twenty-four hours before the induction of leucocytosis there was a greater mortality, though even then benefit seemed to result from its induction.

In conclusion the authors express their belief that fever and leucocytosis should be regarded as of assistance to the body in combating the effects of infection, and they suggest that therapeutic benefit may be derived rather from the use of means tending to increase these conditions than from those antagonizing them.

THE ŒDEMA OF RENAL DISEASE.

Three distinct forms of œdema are believed by SENATOR (*Berl. klin. Woch.*, 1895, No. 8, p. 165) to occur in nephritis. The first of these has a purely mechanical cause, depending upon interference with the circulation

as a result of weakness of the heart-muscle. The second is observed in slow, chronic, and severe cases of nephritis, and is due to the establishment of a state of cachexia. The third variety differs essentially from these, in that it is observed very early in the course of the disease, being often the earliest symptom; shows a predilection for certain parts of the body (eyelids, scrotum, front of the legs, etc.), where it is first observed or to which it is limited; spreads rapidly, and soon, as a rule, becomes very generally distributed; and in that the affected parts have a peculiar paleness quite different from the cyanotic condition observed in œdema resulting from interference with the circulation alone.

Senator discards the theories of Bright and Grainger Stewart in explanation of this condition, inclining more to Cohnheim's view that it is due to an abnormal inflammatory condition of the small bloodvessels of the skin, in consequence of which there is an inordinate escape of the liquid ingredient of the blood. That in acute nephritis there is a peculiar predisposition to such inflammatory changes in the bloodvessels is shown by the frequency of actual inflammation as a complication in such cases, particularly of inflammation of the serous membranes.

An investigation of the various forms of acute nephritis shows this variety of œdema to occur most often in the nephritis complicating scarlatina, in that resulting from exposure to cold, in the nephritis occurring in association with malaria, and in the nephritis of pregnancy, in all of which the microscope shows a preponderant involvement of the glomeruli. This is regarded by Senator as substantiating his theory that the œdema is primarily the result of changes in the bloodvessels brought about by the action on them of the various poisons of these diseases. The glomeruli of the kidneys are very naturally among the first of the bloodvessels to be affected, both because of the high blood-pressure which exists in them, and because of the intimate contact of their endothelium with the substances which are eliminated by them. The changes in the renal glomeruli can be seen and studied, and there is no question as to their existence. To explain the œdema which is present in the same cases, Senator supposes similar changes to occur in the small vessels of the skin and other parts of the body.

The conditions in subacute and chronic nephritis in which this form of œdema occurs are similar to those existing in the acute varieties. In all there is change in the glomeruli.

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